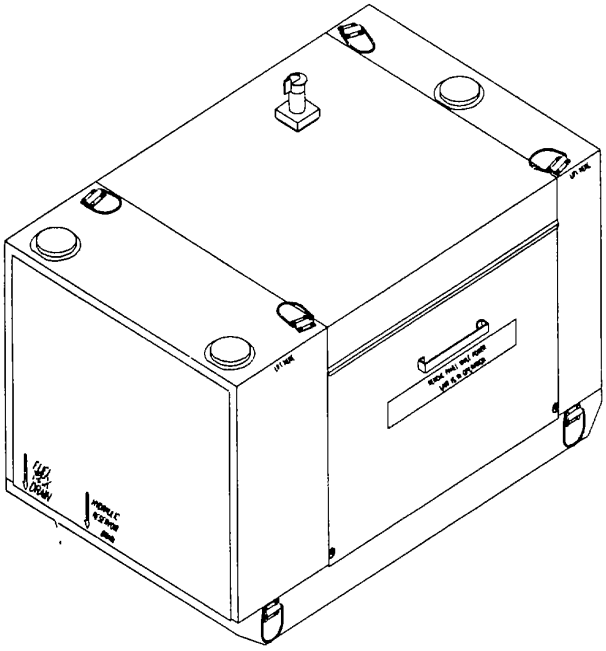
TECHNICAL MANUAL

OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR POWER SUPPLY, HYDRAULIC MODEL 9305 NSN 1730-01-342-2184 EIC YX6



OPERATING INSTRUCTIONS	2-1
OPERATOR TROUBLESHOOTING	3-2
UNIT MAINTENANCE INSTRUCTIONS	4-1
UNIT TROUBLESHOOTING	4-10
DIRECT SUPPORT TROUBLESHOOTING	5-1
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS	5-4
GENERAL SUPPORT MAINTENANCE INSTRUCTIONS	6-1
MAINTENANCE ALLOCATION CHART	B-1

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H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y

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WARNING

- Carbon monoxide can kill. Do not breathe exhaust gases. Operate power unit with adequate ventilation.
- Combustion hazard. Fuels and oils are flammable. Avoid open flames, heat, smoking or ignition sources in areas of storage or use.
- Noise hazard. Avoid risk of hearing loss. Personnel must use hearing protection within close proximity to power unit.
- Chemical hazard. Repeated or prolonged contact with liquid petroleum products or inhalation of vapors can cause skin and eye irritation, dermatitis, narcotic effects, and damage to internal organs. Avoid skin contact with fuels, oils, lubricants, and hydraulic fluids. Wear protective goggles and gloves Use only in well-ventilated areas.
- Mechanical hazard. Severe injury can result from contact with rotating, moving, or hot components. Perform all maintenance checks, services, and procedures with the equipment shut down. If operation of the equipment is necessary for maintenance purposes, stay clear of all rotating, moving or hot components.
- Refer to FM21-11 for first aid.

TECHNICAL MANUAL

NO 5-1730-245-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D C, 28 February 1995

TECHNICAL MANUAL
Operator's, Unit, Direct Support and General Support Maintenance Manual
for Power Supply, Hydraulic, Model 9305, NSN 1730-01-342-2184
EIC YX6

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can Improve this manual. If you find any mistakes or if you know of a way to Improve procedures, please let us know. Mall your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual, direct to: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

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TABLE OF CONTENTS

Page

HOW TO USE THIS MANUAL iii

CHAPTER 1 INTRODUCTION 1-1
Section I General Information 1-1
Section II Equipment Description 1-3
Section III Principles of Operation 1-5

CHAPTER 2 OPERATING INSTRUCTIONS 2-1
Section I Description and Use of Operator's Controls and Indicators 2-3
Section II Operator Preventive Maintenance Checks and Services 2-5
Section III Operation Under Usual Conditions 2-9
Section IV Operation Under Unusual Conditions 2-14

CHAPTER 3 OPERATOR MAINTENANCE INSTRUCTIONS 3-1
Section I Operator Lubrication Instructions 3-2
Section II Operator Troubleshooting 3-2
Section III Operator's Maintenance Procedures 3-4

CHAPTER 4 UNIT MAINTENANCE INSTRUCTIONS 4-2
Section I Unit Lubrication Instructions 4-3
Section II Repair Parts and Special Tools, Test, Measurement, and Diagnostic Equipment (TMDE), and Support Equipment 4-7
Section III Service Upon Receipt 4-7
Section IV Unit Preventive Maintenance Checks and Services 4-8
Section V Unit Troubleshooting 4-10
Section VI Unit Maintenance Procedures 4-20
Section VII Preparation for Storage and Shipment 4-35

CHAPTER 5 DIRECT SUPPORT MAINTENANCE INSTRUCTIONS 5-1
Section I Direct Support Troubleshooting 5-1
Section II Direct Support Maintenance Procedures 5-4

CHAPTER 6 GENERAL SUPPORT MAINTENANCE INSTRUCTIONS 6-1
Section I General Support Maintenance Procedures 6-1

APPENDIX A, REFERENCES A-1

APPENDIX B, MAINTENANCE ALLOCATION CHART B-1

APPENDIX C, COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST C-1

APPENDIX D, ADDITIONAL AUTHORIZATION LIST D-1

APPENDIX E, EXPENDABLE AND DURABLE PARTS LIST E-1

APPENDIX F, OPERATOR LUBRICATION INSTRUCTIONS F-1

APPENDIX G, ILLUSTRATED LIST OF MANUFACTURED ITEMS G-1

APPENDIX H, TORQUE LIMITS H-1

APPENDIX I, MANDATORY REPLACEMENT PARTS I-1

INDEX ..... Index 1

HOW TO USE THIS MANUAL

This manual contains operating and maintenance instructions for the Hydraulic Power Supply and is used in conjunction with TM 5-1730-245-24P which is the Repair Parts and Special Tools List for this unit.

The manual is divided into 6 chapters and 8 appendixes which are indexed on the front cover.

- Chapter 1-Introduces the user to the equipment with a general description of the unit, its principles of operation and generally used abbreviations.
- Chapter 2-Contains the operating instructions Operating instructions in this chapter tell you how to use the equipment in both usual and unusual weather conditions.
- Chapter 3-Provides operator troubleshooting procedures for identifying equipment malfunctions and maintenance procedures for performing operator maintenance tasks.
- Chapter 4-Provides unit maintenance personnel with troubleshooting procedures for identifying equipment malfunctions and maintenance procedures for repairing defective equipment.
- Chapter 5-Provides direct support maintenance personnel with troubleshooting procedures for identifying equipment malfunctions and maintenance procedures for repairing defective equipment
- Chapter 6-Provides general support maintenance personnel with maintenance procedures for repairing defective equipment and component maintenance
- Appendix A-Contains a list of current references, including supply manuals, forms, technical manuals and other available publications applicable to the unit.
- Appendix B-Contains the Maintenance Allocation Chart for the unit listing the maintenance and repair operations authorized for the unit and their assignment
- Appendix C-Is the Components of End items and Basic Issue Items list
- Appendix D-Is the Additional Authorization List and indicates that none are authorized
- Appendix E-Is the listing of expendable and durable items
- Appendix F-Contains lubrication instructions for the unit.
- Appendix G-Is the illustrated list of manufactured items and indicates there are none for this unit.
- Appendix H-Is a table of torque limits for maintenance of the unit.
- Appendix I-Is the mandatory replacement parts for the unit.

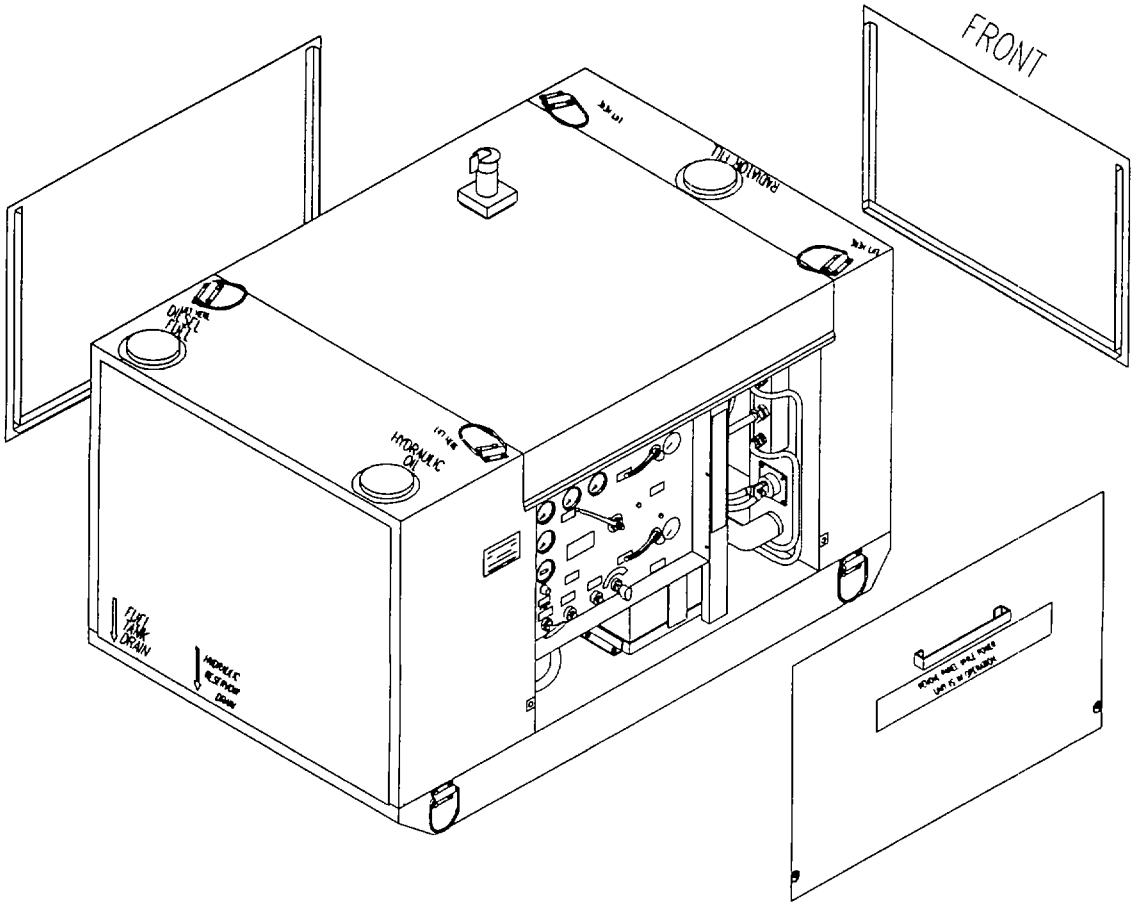


Figure 1-1. Hydraulic Power Supply.

CHAPTER 1
INTRODUCTION

SECTION I. GENERAL INFORMATION

1.1 SCOPE.

1.1.1 Type of manual: Operators, Unit, Direct Support and General Support Maintenance Manual.

1.1.2 Model number and equipment name: Model 9305, Power Supply, Hydraulic.

1.1.3 Purpose of the unit: Provide a dual source of hydraulic energy. Each circuit provides 8 GPM of hydraulic fluid at 2000 PSI through quick disconnect outlet fittings. Permits both circuits to be combined to provide 16 GPM of hydraulic fluid at 2000 PSI in one circuit

1 2. **MAINTENANCE FORMS, RECORDS AND REPORTS**. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 as contained in the Army Maintenance Management System (TAMMS).

1.3 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE. Procedures for destroying Army materiel to prevent enemy use are listed in TM 750-244-3.

1.4 PREPARATION FOR STORAGE OR SHIPMENT. Instructions are provided in Chapter 4, Section VII of this manual.

1.5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR) If your Hydraulic Power Supply needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance Put It on an SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Aviation and Troop Command, ATTN. AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 We will send you a reply.

1.6 WARRANTY INFORMATION. The Power Supply is warranted by the manufacturer against defects in materials and workmanship, under normal use and service, for a period of 12 months from the original date of delivery.

1.7 CORROSION PREVENTION AND CONTROL. Corrosion prevention and control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that they may be corrected and improvements made to future items. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling or breakage of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of words such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750.

1.8 LIST OF ABBREVIATIONS. The following abbreviations are used throughout this manual:

GPM	Gallons per minute	Deg. F.	Degrees Fahrenheit
RPM	Revolutions per minute	In lb.	Inch pound
PSI	Pounds per square inch	Ft. lb.	Foot pound
AOAP	Army Oil Analysis Program	SOP	Standard Operating Procedure

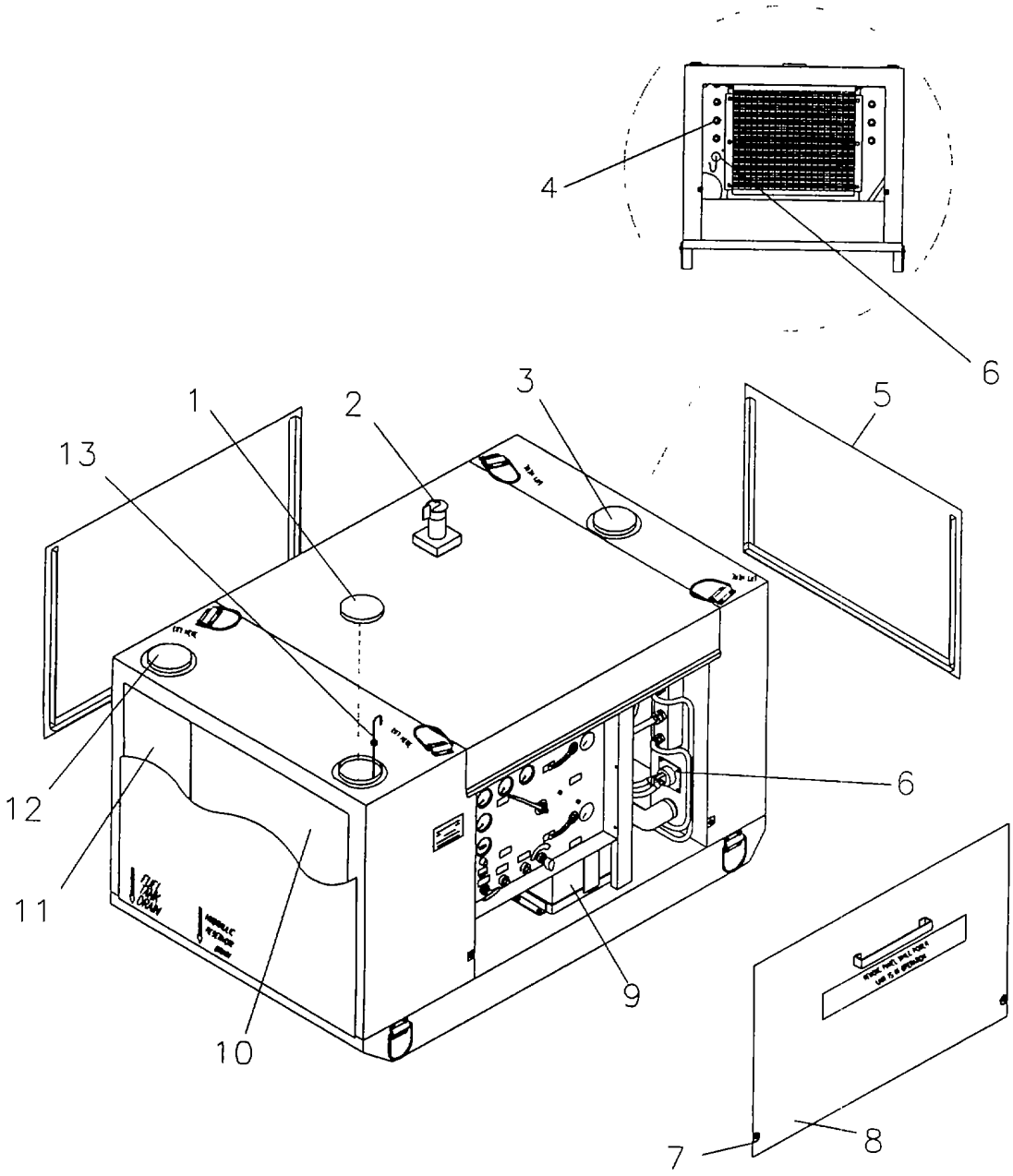


Figure 1-2. Major Components.

SECTION II. EQUIPMENT DESCRIPTION

1.10 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

1 10.1 The power unit is a skid mounted diesel engine driven hydraulic power supply.

1 10.2 The unit provides two independent circuits of 8 GPM hydraulic fluid at 2000 PSI Either circuit may be unloaded independently of the other when not required

1.10.3 The two circuits can be manifolded to form one 16 GPM circuit at 2000 PSI by means of panel mounted valves

1.10 4 The power supply is completely self contained and has its own hydraulic oil and diesel fuel reservoirs, engine and hydraulic oil radiators as well as all necessary hydraulic components and regulators.

1.10.5 Standard flush face quick disconnects are provided on the unit inlet and outlet ports.

1 11 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. **(Figures 1-2 and 1-3).**

1.11 1 Figure 1-2 indicates the location of the following major components found on the power supply:

1 HYDRAULIC OIL FILLER CAP Provides access to fill the hydraulic reservoir.

2 ENGINE EXHAUST. Vents engine exhaust.

3 ENGINE RADIATOR ACCESS CAP. Provides access to radiator.

4 HYDRAULIC CONNECTIONS Inside front cover

5 REMOVABLE FRONT PANEL. This panel closes up the front of unit for outside storage or shipment.

6 SLAVE RECEPTACLE. Connects to battery, may be used to charge battery or to connect external 24 volt accessory.

7 QUICK DISCONNECT FASTENER. Quarter turn fasteners used to fasten the panels.

8 REMOVABLE SIDE PANELS. These panels close up the sides of the unit for outside storage or shipment.

9 BATTERY. Source of 24 volt DC.

10 HYDRAULIC FLUID RESERVOIR. Stores hydraulic fluid.

11 FUEL TANK. Stores fuel.

12 FUEL FILLER ACCESS CAP. Provides access to fill the fuel tank.

13 HYDRAULIC FLUID RESERVOIR DIPSTICK. Measures level of hydraulic fluid

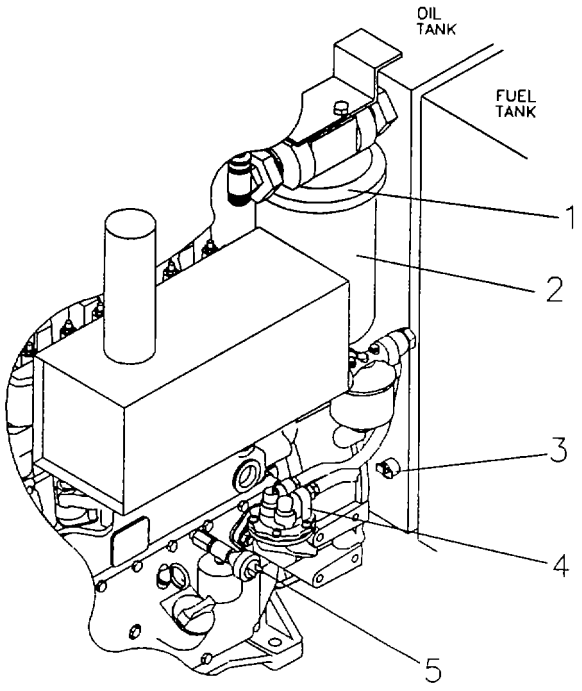


Figure 1-3. Major Components. Continued.

1.11.2 Figure 1-3 indicates the location of the following major components found on the power supply:

1 HOUSING, HYDRAULIC FLUID FILTER. Connects hydraulic fluid filter to hydraulic fluid reservoir.

2 HYDRAULIC FLUID FILTER. Filters hydraulic fluid.

3 SAMPLING VALVE. Provides samples of hydraulic fluid

4 FUEL LIFT PUMP. Supplies fuel to the four fuel injector pumps.

5 OIL PRESSURE SWITCH. Shuts down unit with loss of engine oil pressure.

1.12 <u>EQUIPMENT DATA</u>.

MANUFACTURER.....Hydraulic Technology Inc.
Rocklin, California, USA

PERFORMANCE

Engine Horsepower .....35 9 Continuous HP at 3000 RPM.

Hydraulic Output Flow .....Two circuits at 8 GPM each or one circuit at 16 GPM.

Hydraulic Pressure .....2000 PSI.

CAPACITIES

Fuel Reservoir Capacity ..... 10.5 gallons/39.74 liters

Hydraulic Reservoir Capacity..... 25 gallons/94.6 liters

Engine Oil Capacity.....5.6 quarts/5.3 liters

Coolant Capacity ..... 2 gallons/7.57 liters

WEIGHTS AND DIMENSIONS

Weight (Dry).....965 lbs./438 kg.

Shipping Weight .....1195 lbs./543 kg.

Length ..... 58 1/2 inches/148.6 cm

Width.....39 inches/99.1 cm

Height..... 40 1/2 inches/101.6 cm

Shipping Cube .....53.47 cu. ft./2.69 cu. meters.

SECTION III. PRINCIPLES OF OPERATION

1.13 FUNCTIONAL GROUPS

1.13.1 The hydraulic power supply may be conceived as five functional groups: An engine driven hydraulic pump, a panel mounted grouping of instruments and controls, a hydraulic control manifold, cooling system and reservoir assemblies.

1.13.1.1 Engine Driven Hydraulic Pump A dual hydraulic pump is directly mounted to a diesel engine. This pump has two independent hydraulic output which are supplied from a common inlet

1.13.1.2 The engine operating instruments and controls are grouped together on the operators panel. The panel also contains the hydraulic valves used to divert the flow of hydraulic fluid as required for operation.

1.13.1.3 A hydraulic manifold block mounted in the interior of the unit provides the pressure relief, thermal regulation and flow control functions of the unit.

1.13.1.4 An engine driven fan draws cooling air from outside the unit across the cooler assembly. The cooler assembly consists of two air to oil coolers mounted in tandem. The front cooler serves the hydraulic system while the rear cooler serves the engine cooling system.

1.13.1.5 Two reservoir assemblies are located in the unit. The fuel reservoir content is indicated on a panel mounted indicator. The hydraulic oil reservoir assembly consists of the reservoir, filter assembly, sampling and drain valves and high oil temperature switch.

1.14. CIRCUIT DESCRIPTION (Figure 1-4).

1.14.1 Pressure system. Hydraulic oil is drawn from the reservoir (1) to the common inlet of the dual hydraulic pump (2). Two hoses then direct the output of the two independent pump sections to a manifold block. The manifold block contains two relief valves (3) and (4), the thermal diverter valve (14), and controls the required flow paths. The relief valves (3) and (4) are used to control the pressure in each system independently. They are externally adjustable and are normally set to limit the maximum pressure at 2800 psi The two fluid systems from the manifold block are directed to the quick disconnects at the front of the unit The system outlets are labeled as circuit #1 and circuit #2. Each outlet system is connected to return to the reservoir, by one of the panel mounted valves (5) or (6), which serve to unload its system pressure to the reservoir when opened. Valve (9) must be in the open (bypass) position for this to occur. If valve (9) is in the "CIRCUIT NO 3 PRESSURE" position when the selector valves (5) and (6) are in the "CIRCUIT NO. 3 16 GPM" position, the combined output of the two pump sections is available at the third outlet port (10) at the front of the hydraulic power supply. This outlet is labeled circuit #3

1.14 2 Return system. Each system has its own return port (11),(12) and (13) which are identified by labels. The return flows are directed in the unit to the hydraulic control manifold where they are diverted to the reservoir through a return filter (16). The thermal valve (14) channels the return flow either through the cooler (15) or bypasses it depending on the return fluid temperature. The thermal valve is set to start diverting the fluid through the cooler at 105 degrees F.

1.14.3 Safety limits. A temperature switch in the hydraulic system (19) will shut down the engine if the hydraulic fluid temperature exceeds 160 degrees F. Additional limit switches on the engine will also cause engine shutdown if the engine overheats (21) or in the event of oil pressure failure (20)

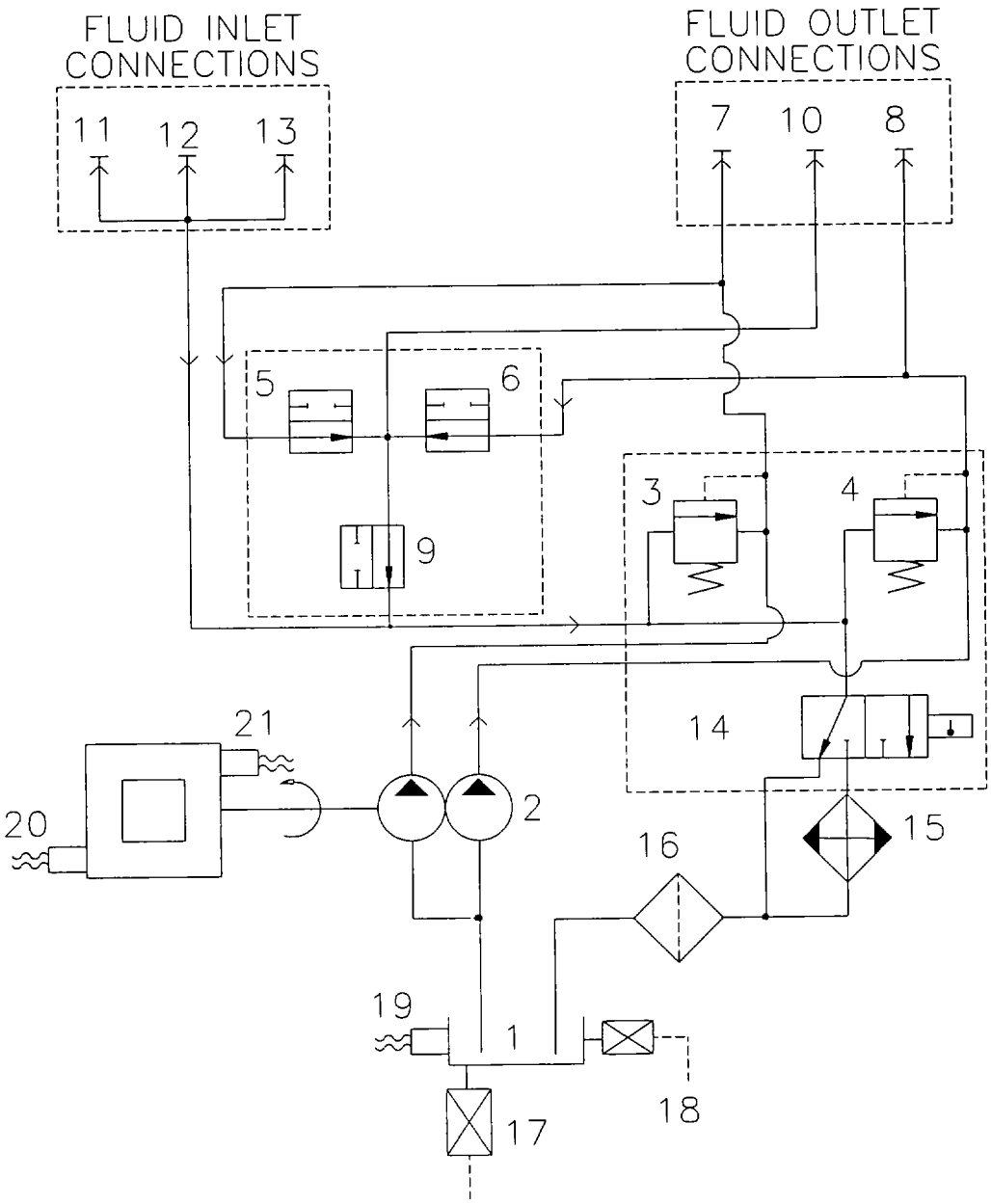


Figure 1-4. Hydraulic Schematic. (Start up Position).

CHAPTER 2

OPERATING INSTRUCTIONS

			Page
SECTION I	DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS		2-3
	2.1	Operating Controls and Indicators	2-3
SECTION II	OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES		2-5
	2.2	Introduction to PMCS Table	2-5
	2.3	PMCS Procedures	2-6
	2.4	Leakage Definition for Operator Preventive Maintenance Checks and Services	2-7
SECTION III	OPERATION UNDER USUAL CONDITIONS		2-9
	2.5	Preparation for Use, Storage and Shipment	2-9
	2.6	Starting the Hydraulic Power Supply	2-9
	2.7	Slave Receptacle	2-9
	2.8	Operation In Dual Mode	2-10
	2.9	Operation in Combined Mode	2-10
	2.10	Stopping the Hydraulic Power Supply	2-10
	2.11	Decals and Instruction Plates	2-11
SECTION IV	OPERATION UNDER UNUSUAL CONDITIONS		2-14
	2.12	Low Temperature Operation	2-14
	2.13	High Temperature Operation	2-14
	2.14	Nuclear, Biological and Chemical (NBC) Decontamination Procedures	2-14

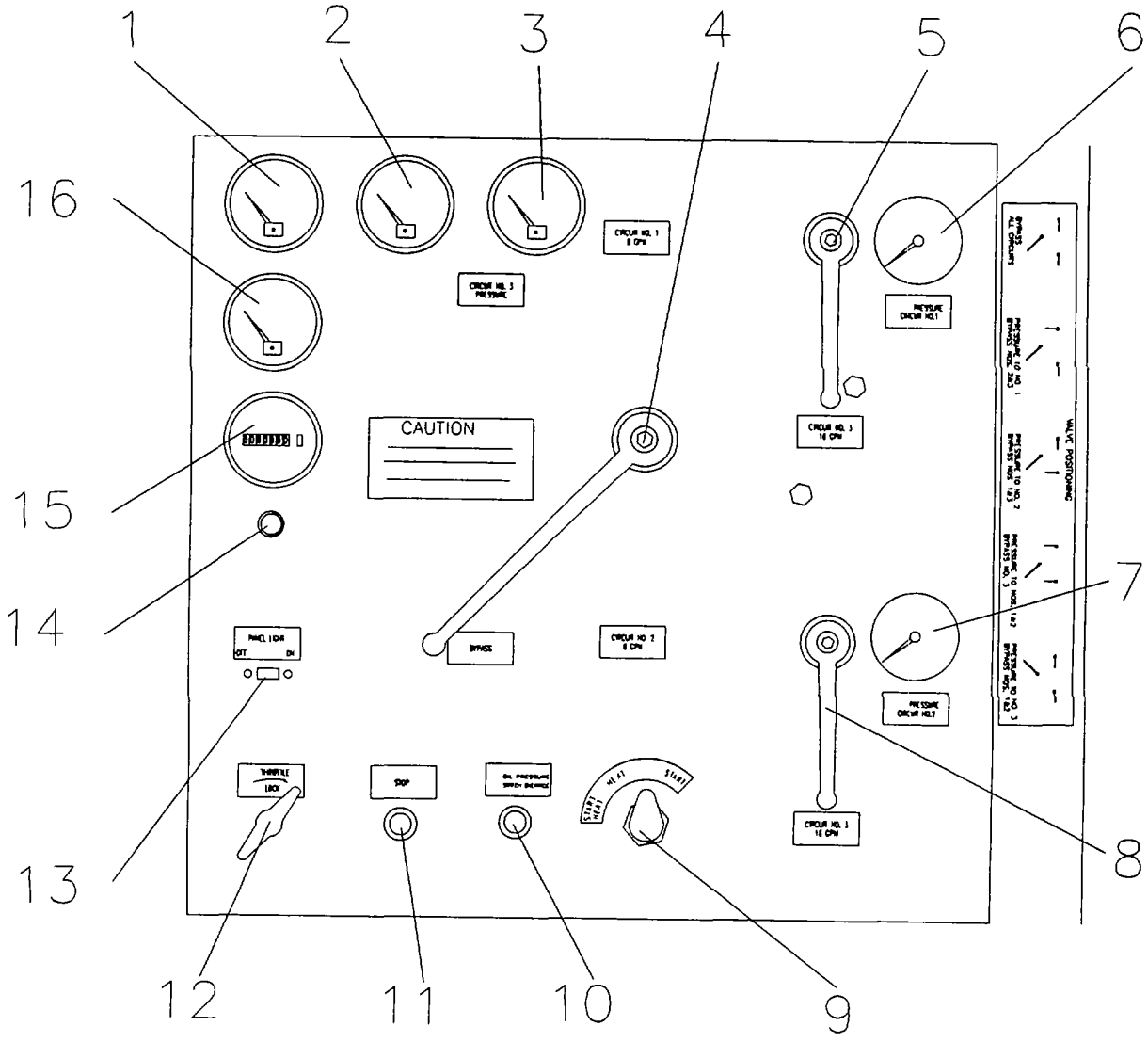


Figure 2-1. Control Panel. (Start Up Position).

SECTION I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2.1. OPERATING CONTROLS AND INDICATORS.

2.1.1. Control Panel. (Figure 2-1).

1 FUEL GAUGE. Indicates diesel fuel quantity.

2 OIL PRESSURE GAUGE. Indicates engine oil pressure.

3 TEMPERATURE GAUGE. Indicates engine coolant temperature.

4 HYDRAULIC SELECTOR VALVE. A two position valve which in the BYPASS position returns the output of both pumps to the reservoir and in the CIRCUIT NO 3 PRESSURE position blocks the return permitting the full output of the two pumps to be delivered to the quick disconnect PRESSURE PORT 16 GPM CIRCUIT NO 3.

5 HYDRAULIC SELECTOR VALVE. When this valve handle is pointed to the CIRCUIT NO 1, 8 GPM position the output of one of the two pumps is directed to the quick disconnect fitting PRESSURE PORT 8 GPM CIRCUIT NO. 1. In the other position 16 GPM CIRCUIT NO 3, the output of this pump is directed to the quick disconnect PRESSURE PORT 16 GPM CIRCUIT NO. 3 and to the two position hydraulic selector valve (4).

6 PRESSURE GAUGE, CIRCUIT NO. 1. Indicates Circuit No 1 hydraulic pressure.

7 PRESSURE GAUGE, CIRCUIT NO. 2. Indicates Circuit No 2 hydraulic pressure.

8 HYDRAULIC SELECTOR VALVE. This two position hydraulic selector valve is identical in function to valve (5) except that it controls the second hydraulic pump in the system. When this two position valve handle is pointed to the CIRCUIT NO. 2, 8 GPM position the output of one of the two pumps is directed to the quick disconnect fitting PRESSURE PORT 8 GPM CIRCUIT NO 2. In the other position CIRCUIT NO 3, 16 GPM, the output of this pump is directed to the quick disconnect PRESSURE PORT 16 GPM CIRCUIT NO. 3 and to the two position hydraulic selector valve (4).

9 ROTARY STARTING SWITCH Turn clockwise to START to start the engine without the use of preheating. Turning counterclockwise to HEAT and holding It in that position, switches on the engine preheaters. Turning further counterclockwise to HEAT/START position starts the engine while maintaining the preheaters switched on. All the switch positions are momentary, when released the switch is returned by spring force to the off position.

10 OIL PRESSURE OVERRIDE SWITCH. Push to override the engine oil pressure safety switch when starting.

11 STOP SWITCH. Pushbutton, momentary. Depress this pushbutton to stop the engine.

12 THROTTLE HANDLE. Pull out to increase engine RPM. Can be locked in any position by rotating clockwise.

13 PANEL LIGHT SWITCH. Activates the panel light.

14 FUSEHOLDER. Contains 10 amp fuse that protects the 24 volt electric system.

15 HOURMETER. Indicates the elapsed time that the hydraulic power supply has been running.

16 AMMETER Indicates battery charge or discharge and amperage output.

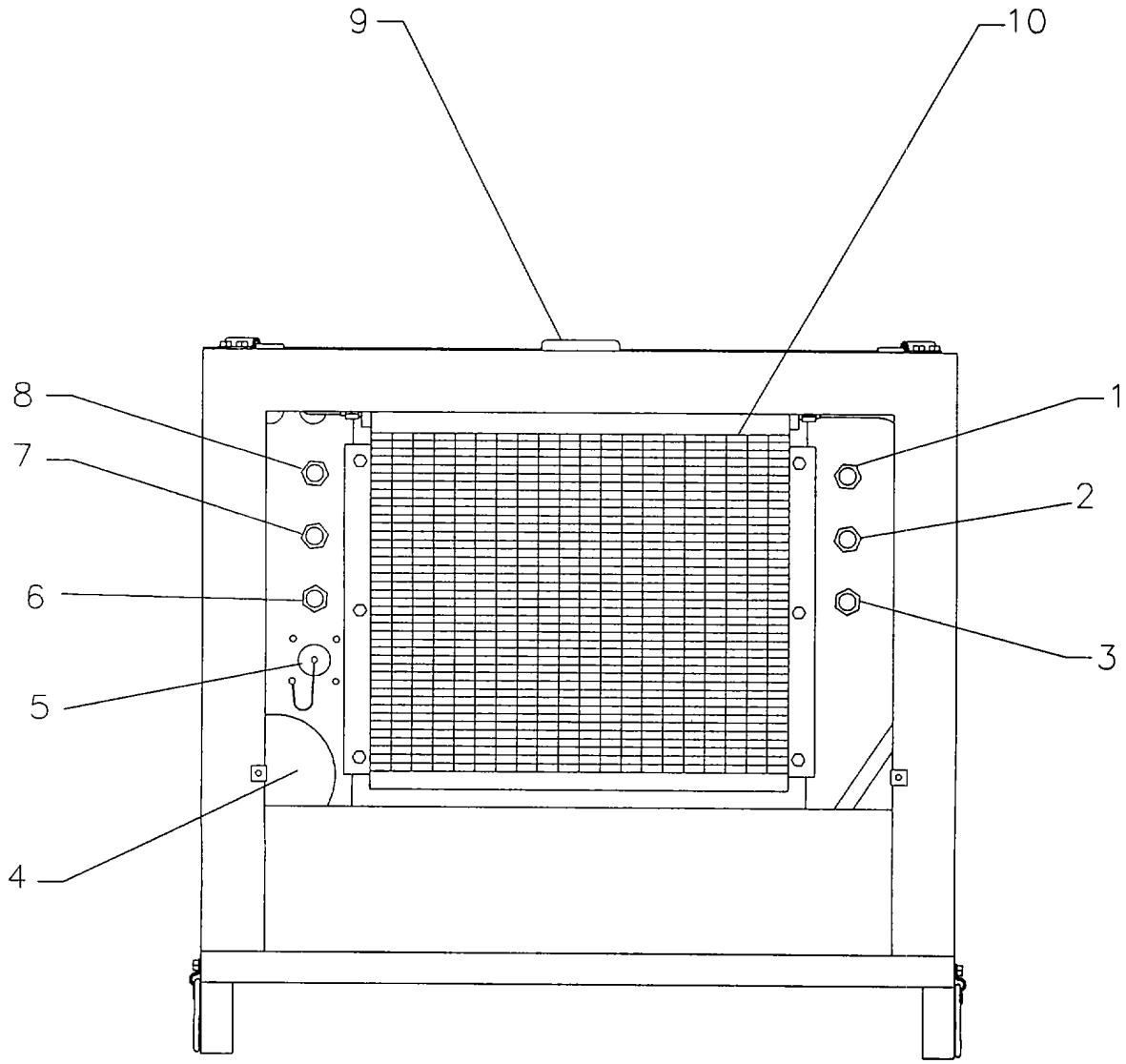


Figure 2-2. Hydraulic Power Supply Connections.

2.1.2. Hydraulic Power Supply Connections. (Figure 2-2).

1 RETURN PORT 8 GPM CIRCUIT NO. 1. Quick disconnect fitting to which the return hose of a hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the dual output mode.

2 RETURN PORT 16 GPM CIRCUIT NO. 3. Quick disconnect fitting to which the return hose of the hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the single 16 GPM output mode.

3 RETURN PORT 8 GPM CIRCUIT NO. 1. Quick disconnect fitting to which the return hose of a hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the dual output mode.

4 AIR FILTER. Filters air prior to engine intake manifold.

5 SLAVE RECEPTACLE. Electric receptacle which can be used for charging the battery, jump starting from an external electric power source or as a means of connecting external 24 volt devices such as lamps.

6 PRESSURE PORT 8 GPM CIRCUIT NO. 2. Quick disconnect fitting to which the pressure hose of a hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the dual output mode

7 PRESSURE PORT 16 GPM CIRCUIT NO. 3. Quick disconnect fitting to which the pressure hose of the hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the single 16 GPM output mode

8 PRESSURE PORT 8 GPM CIRCUIT NO 1. Quick disconnect fitting to which the pressure hose of a hydraulic device being supplied by the hydraulic power supply is connected, when the unit is being used in the dual output mode

9 RADIATOR FILL ACCESS CAP. Remove this cap to provide access to the engine radiator fill cap.

10 OIL/COOLANT RADIATOR ASSEMBLY. Provides cooling to hydraulic oil and engine coolant.

SECTION II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2.2 INTRODUCTION TO PMCS TABLE.

2.2.1. General Preventive maintenance checks and services (PMCS) means systematic caring, inspection and servicing of equipment to keep it in good condition and to prevent breakdowns. As the equipment operator, your mission is to:

a. Perform PMCS each time you operate the hydraulic power supply. Always do PMCS in the same order, so it gets to be a habit. Once you've had some practice, you'll quickly spot anything wrong

b. Do BEFORE (B) PMCS just before you operate. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

c. Do DURING (D) PMCS while you operate the hydraulic power supply. During operation means to monitor the

hydraulic power supply and its related components while it is actually being operated. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

d. Do AFTER (A) PMCS right after operating hydraulic power supply. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

e. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults you discover before, during, or after operation, unless you are authorized to fix them

2.3 PMCS PROCEDURES. Preventive Maintenance Checks and Services, Table 2-1, lists inspections and care required to keep hydraulic power supply in good operating condition.

a. Item number column. This is the order in which you perform checks and services on the hydraulic power supply. The entry in this column will also be used as a source of item numbers for the "TM Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, In recording results of PMCS.

b. The "INTERVAL" column of Table 2-1 tells you when to do a certain check or service.

c. The "PROCEDURE" column of Table 2-1 tells you how to do required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, notify your supervisor.

NOTE

Terms “ready/available" and “mission capable" refer to same status. Equipment is on hand and ready to perform its combat mission. (See DA Pam 738-750)

d. The "EQUIPMENT IS NOT READY/AVAILABLE IF" column in Table 2-1 tells you when your hydraulic power supply is nonmission capable and why the hydraulic power supply cannot be used.

e. If the hydraulic power supply does not perform as required, refer to Chapter 3, Section II, Troubleshooting.

f. If anything is wrong and you can't fix it, write it on your DA Form 2404. IMMEDIATELY report it to your supervisor.

g. When you do your PMCS, you will always need a rag or two. Following are checks that are common to the entire hydraulic power supply:

(1) Keep It Clean. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed.

(2) Rust and Corrosion. Check the hydraulic power supply for rust and corrosion. If any bare metal or corrosion exists, clean, and spot paint as required. Report it to your supervisor.

(3) Bolts, Nuts, and Screws. Check them all for obvious looseness, missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find a bolt, nut, or screw, you think is loose, report it to your supervisor

(4) Welds. Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad, cracked or broken weld, report it to your supervisor.

(5) Electric Wires and Connectors. Look for cracked, frayed, or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Report any damaged wires to your supervisor.

(6) Hoses and Fluid Lines. Look for wear, cuts, and leaks and make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to your supervisor.

h. When you check for "operating condition" look at the component to see if it's serviceable.

NOTE

If the hydraulic power supply must be kept In continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the machine is shut down.

2.4. LEAKAGE DEFINITIONS FOR OPERATOR PMCS.

2.4.1 Leakage Definitions for Operator PMCS. It is necessary for you to know how fluid leakage affects the status of the hydraulic power supply. Following are types/classes of leakage an operator needs to know to be able to determine the status. Learn these leakage definitions and remember - when in doubt, notify your supervisor

CAUTION

- Equipment operation is allowable with minor leakage (Class I or II). Of course, consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.
- When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.
- Class III leaks should be reported immediately to your supervisor.

a. Class I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

b. Class II - Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

c. Class III - Leakage of fluid great enough to form drops that fall from item being checked/inspected.

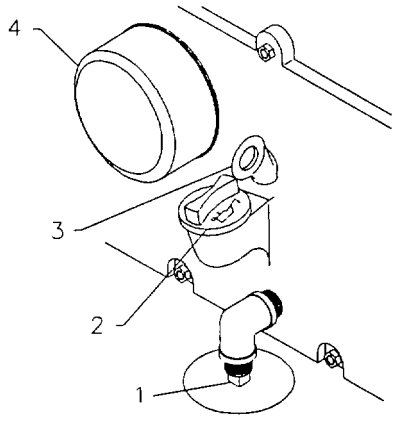


Figure 2-3. Engine Oil Dipstick.

Table 2-1. Operator's Preventive Maintenance Checks and Services.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
1	Before	Panels	Check to ensure panels (5 and 8, Fig 1-2) are removed.	Front and side panels not removed.
2	Before	Instruments	Inspect instruments (1, 2, 3, 6, 7, 15, and 16, Fig 2-1) for obvious damage (cracks, looseness etc.)	
3	Before	Cabinet Interior	Inspect hydraulic line for leakage Inspect engine oil and hydraulic filters for leakage. Check for fuel leakage.	Class III leakage observed. Refer to paragraph 2 4. Any fuel leakage.
4	Before	Hydraulic Fluid Tank	Check dipstick (13, Fig 1-2) for adequate hydraulic fluid level.	Insufficient oil.
5	Before	Hydraulic Pump	Inspect pump for security of mounting	Loose or missing hardware.
6	Before	Hoses	Check for missing or unserviceable, or hoses. Check all hose connections (1, 2, 3, 6, 7, and 8, Fig 2-2) for tightness.	Loose, missing, unserviceable, or disconnected hoses
7	Before	Hydraulic selector valves	Check for proper position as shown in Figure 2-1.	
8	Before	Engine	Check dipstick (3, Fig 2-3) for adequate oil level. Inspect the engine assembly for loose components or wires.	Insufficient oil. Loose components or wires
9	Before	Fuel Tank	Check fuel gauge (1, Fig 2-1) for adequate fuel. Refer to Appendix E.	No fuel
10	Before	Engine Radiator	Remove radiator access cap (9, Fig 2-2) and inspect to ensure radiator is filled with coolant. Refer to Appendix E, Item 1.	Coolant low or missing.
11	Before	Fan Belt	Inspect for serviceability.	Unserviceable.
12	During	Instruments	Check to ensure instruments.	Non-functioning. are functioning.

Table 2-1. Operator's Preventive Maintenance Checks and Services. (Cont.)

ITEM NO	INTERVAL	LOCATION ITEM TO CHECK/SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
13	During	Cabinet Interior	Check for hydraulic line leakage. Check for fuel leaks. Check for loose or unserviceable components.	Class III leakage observed. Refer to paragraph 2 4. Any fuel leak. Components unserviceable.
14	After	Cabinet Interior	Check for hydraulic line leakage. Check for fuel leaks.	Class III leakage observed. Refer to paragraph 2 4. Any fuel leak.
15	After	Panels	Check to ensure panels are replaced on unit.	

SECTION III. OPERATION UNDER USUAL CONDITIONS.

2.5 PREPARATION FOR USE, STORAGE AND SHIPMENT. Preparation for use, storage and shipment instructions are contained in Chapter 4, Section VII.

2.6 STARTING THE HYDRAULIC POWER SUPPLY.

a. Remove the two side panels and the rear panel (5 and 8, fig 1-2) from the hydraulic power supply.

b. Place hydraulic selector valves In the positions shown In figure 2-1 Numbers In parenthesis refer to figure
numbers. Position selector valve handles (5 and 8) pointing to the "CIRCUIT NO 3, 16 GPM" position and selector valve handle (4) pointing to "BYPASS".

c. Refer to figure 2-1. Rotate starter switch (9) to the HEAT position and hold It there for 15 to 20 seconds. Depress the pushbutton (10) "OIL PRESSURE OVERRIDE SWITCH" and keep it depressed while rotating switch (9) clockwise to the START position. If the engine does not start in 30 seconds or less, release the starter switch and wait for the engine to stop rotating before trying to start again.

d. When the engine starts, look at the oil pressure gauge (2) to make sure that there is oil pressure and the ammeter (16) to verify that the alternator is charging. Allow the engine to warm up for approximately 5 minutes Increase the engine speed by pulling the "THROTTLE" (12) Turn the throttle clockwise to lock it in position

2.7 SLAVE RECEPTACLE.

A slave receptacle is provided on the hydraulic power supply as illustrated in figure 2-2, item (5). This connection may be used for connecting to an external 24 volt DC source for jump starting or to utilize the output of the power supply alternator to power external 24 volt devices such as lighting.

2.8 OPERATION IN DUAL MODE.

2.8.1 Initial Adjustments and Checks.

Refer to figure 2-2. Connect the hoses from the units to be supplied to the hydraulic power supply. Use PRESSURE PORT 8 GPM CIRCUIT NO. 1 (8) with RETURN PORT 8 GPM CIRCUIT NO 1 (1) for one unit and PRESSURE PORT 8 GPM CIRCUIT NO. 2 (6) with RETURN PORT CIRCUIT NO 2 (3) for the other driven unit.

2.8 2 Operating Procedures- Dual Mode.

Refer to figure 2-1. Both systems are now being bypassed through selector valve (4) To provide full system pressure to circuit NO 1, move selector valve (5) to the "CIRCUIT NO. 1, 8 GPM" position. To provide full system pressure to circuit NO. 2, move selector valve (8) to the "CIRCUIT NO. 2, 8 GPM" position. Either of the two circuits may be used individually or simultaneously. Returning either selector valve (5) or (8) to the "CIRCUIT NO. 3, 16 GPM" position will dump the pressure in its circuit through the 'BYPASS" position of selector valve (4)

2.9 OPERATION IN COMBINED MODE - 16 GPM.

2.9.1 Initial Adjustments for 16 GPM Operation.

a. Refer to figure 2-2. Connect the hoses from the unit to be driven to the hydraulic power supply using PRESSURE PORT 16 GPM CIRCUIT NO. 3 (7) and RETURN PORT 16 GPM CIRCUIT NO. 3 (2) quick disconnect fittings.

2.9.2 Operation in 16 GPM Mode.

a. Refer to figure 2-1. Both systems are now being bypassed through selector valve (4). To provide full system pressure to circuit NO. 3, move selector valve (4) to the PRESSURE position. The full output of both circuits is now combined to give 16 GPM and is being directed to circuit NO 3. Moving selector valve (4) back to the BYPASS position will dump the pressure in the system. Refer to decal located on right side of control panel to verify correct valve position.

2.10 STOPPING THE HYDRAULIC POWER SUPPLY.

a. Refer to figure 2-1. Return all valves to the position shown in figure 2-1. Selector valves (5) and (8) are in the NO. 3, 16 GPM position and selector valve (4) in the BYPASS position.

b. Reduce engine speed to idle by rotating the THROTTLE (12) counterclockwise to unlock and pushing in.

c. Disconnect hoses from the hydraulic power supply and install side panels (8, fig. 1-2) and the front (5, fig 1-2) panel to protect the hydraulic power supply from the elements.

2.11 DECALS AND INSTRUCTION PLATES.

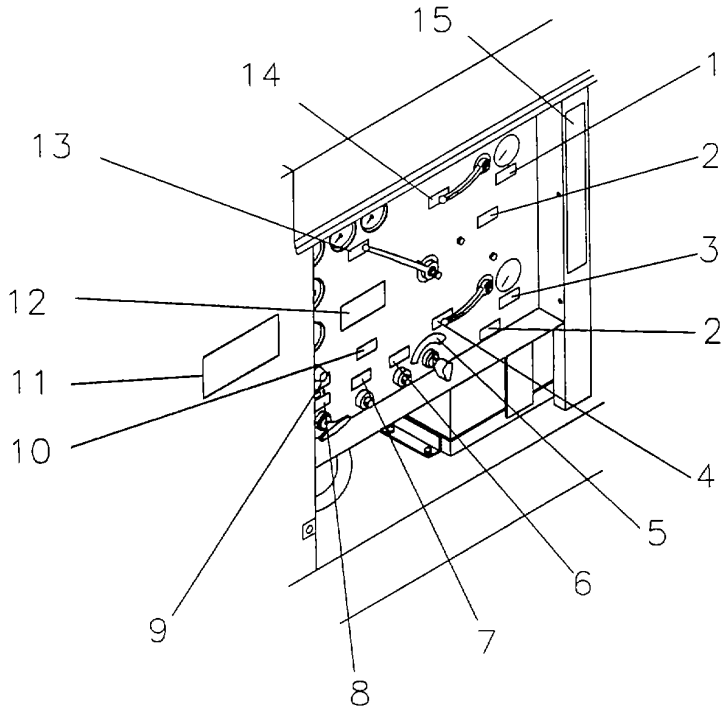


Figure 2-4. Control Panel Decals.

2.11.1 Control Panel Decals. (Figure 2-4).

1 PRESSURE CIRCUIT NO 1

2 TO CIRCUIT NO 3

3 PRESSURE CIRCUIT NO 2

4 CIRCUIT NO 2 8 GPM

5 START HEAT START

6 OIL PRESSURE SWITCH OVERRIDE

7 STOP

8 THROTTLE LOCK

9 PANEL LIGHT OFF ON

10 BYPASS

12
CAUTION
THIS POWER SUPPLY IS DESIGNED FOR USE WITH OPEN-CENTEPED TOOLS DO NOT DISCONNECT TOOLS WITH SYSTEM OPERATING UNLESS ALL CONTROL VALVES ARE IN BYPASS POSITION OVERHEATING AND SUBSEQUENT AUTO SHUT DOWN OF SYSTEM MAY OCCUR

13 CIRCUIT NO 3 PRESSURE

14 CIRCUIT NO 1 8 GPM

11
HYDRAULIC TECHNOLOGY INC
CAGE 29516
ROCKLIN, CALIFORNIA
POWER SUPPLY, HYDRAULIC
NSN 1730-01-342-2148 P/N 9305
CONTRACT DAAK01-93-C-0054 SERIAL NO
FUEL DIESEL IAW ASTM D975-77/MIL-T-83133(JP-8)
HYD FLUID MIL-H-46170 TYPE 1 (NATO H-544) OR MIL-L-2104 GR 10W

15
VALVE POSITIONING
BYPASS ALL CIRCUITS
PRESSURE TO NO 1 BYPASS NOS 2&3
PRESSURE TO NO 2 BYPASS NOS 1&3
PRESSURE TO NOS 1&2 BYPASS NO 3
PRESSURE TO NO 3 BYPASS NOS 1&2

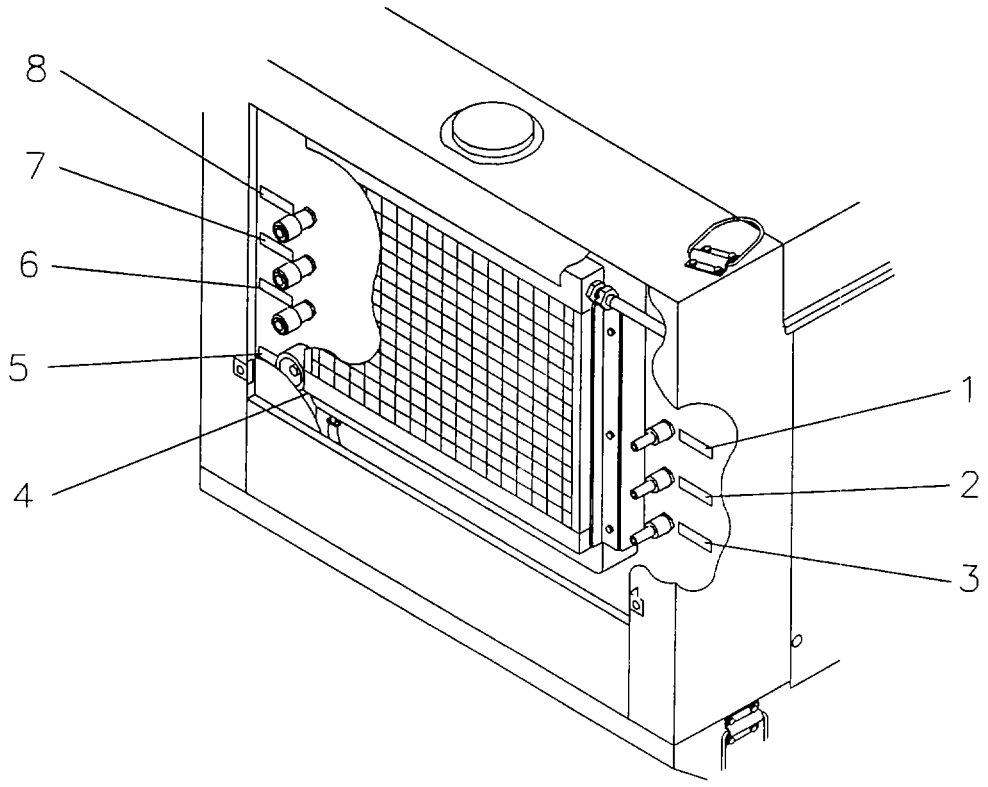


Figure 2-5. Rear Access Decals.

2.11.2 Rear Access Decals. (Figure 2-5).

1	RETURN PORT–8 GPM CIRCUIT NO 2	5	BATTERY CHARGE CONNECTION
2	RETURN PORT–16 GPM CIRCUIT NO 3	6	PRESSURE PORT–8 GPM CIRCUIT NO 2
3	RETURN PORT–8 GPM CIRCUIT NO 2	7	PRESSURE PORT–16 GPM CIRCUIT NO 3
4	RADIATOR DRAIN	8	PRESSURE PORT–8 GPM CIRCUIT NO 1

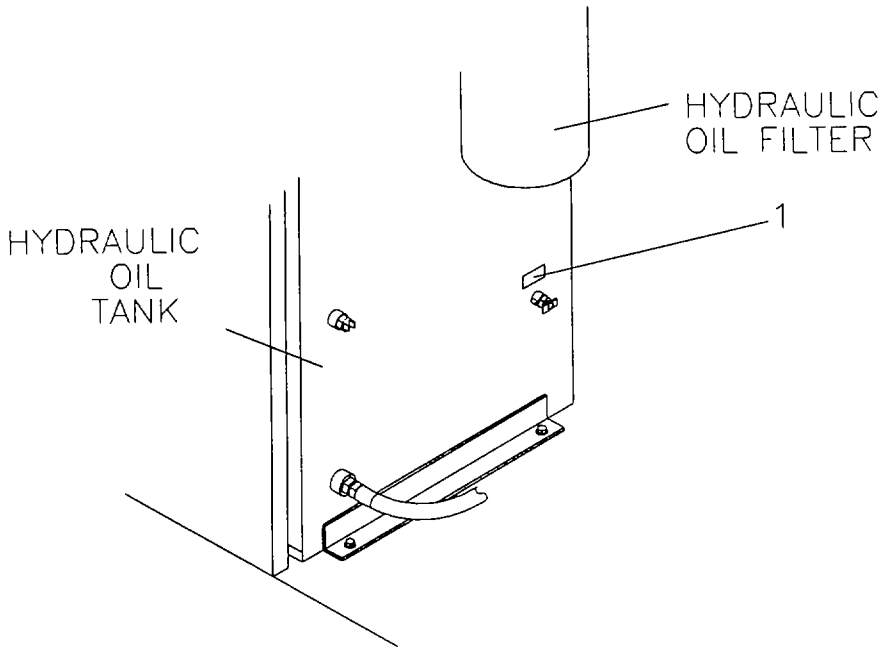


Figure 2-6. Sampling Valve Decal.

2.11.3 <u>Sampling Valve Decal</u>. (Figure 2-6).

1	SAMPLING VALVE

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2.12 LOW TEMPERATURE OPERATION.

a. Position valves and hose connections as for operation under usual conditions. Refer to Section III.

b. Engine oil. Notify Unit Maintenance

c. Starting. Hold the starter switch (9, figure 2-1) in the HEAT position as in normal starting, and move it counterclockwise to the HEAT/START position until the engine fires. As soon as the engine fires return the starter switch to the HEAT position and hold it there for 20-30 seconds.

d. Allow the engine to warm up for five minutes before increasing speed or applying full system pressure

2.13 HIGH TEMPERATURE OPERATION.

a. Engine oil. Notify Unit Maintenance.

b. Use the START position of the starter switch (9, figure 2-1) without the use of HEAT.

2.14 NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) DECONTAMINATION PROCEDURES.

NOTE

DETAILED DECONTAMINATION PROCEDURES ARE CONDUCTED IN ACCORDANCE WITH FM 3-3, FM 34 AND FM 3-5.

2.14.1 General.

Emergency NBC decontamination procedures are conducted In accordance with the local Standard Operating Procedures (SOP).

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Page

SECTION I OPERATOR LUBRICATION INSTRUCTIONS 3-2

3.1 Operator Lubrication Instructions 3-2

SECTION II OPERATOR TROUBLESHOOTING 3-2

3.2 Introduction 3-2
3.3 Troubleshooting Chart 3-2

SECTION III OPERATOR'S MAINTENANCE PROCEDURES 3-4

SECTION I. OPERATOR LUBRICATION INSTRUCTIONS

3.1 OPERATOR LUBRICATION INSTRUCTIONS. There are no lubrications specific to operator maintenance.

SECTION II. OPERATOR TROUBLESHOOTING

3.2 INTRODUCTION. This section provides information useful in the diagnosis and correction of problems or failures that may be encountered in the operation of the hydraulic power supply. Troubleshooting is performed whenever the hydraulic power supply is not functioning properly. Failures and malfunctions may often be traced to relatively simple causes. Table 3-1 is a trouble analysis chart for the operator of the power unit. The chart contains a listing of the troubles that might be encountered, the probable cause of the trouble and action that may be taken to correct the condition. When using the troubleshooting chart refer to the operating procedures in Chapter 2.

3.3 TROUBLESHOOTING CHART.

3.3.1 Table 3-1 lists common malfunctions that you may find with the hydraulic power supply. Perform the tests, inspections and corrective actions In the order they appear in the table.

3 3.2 This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

TABLE 3-1. OPERATOR TROUBLESHOOTING.

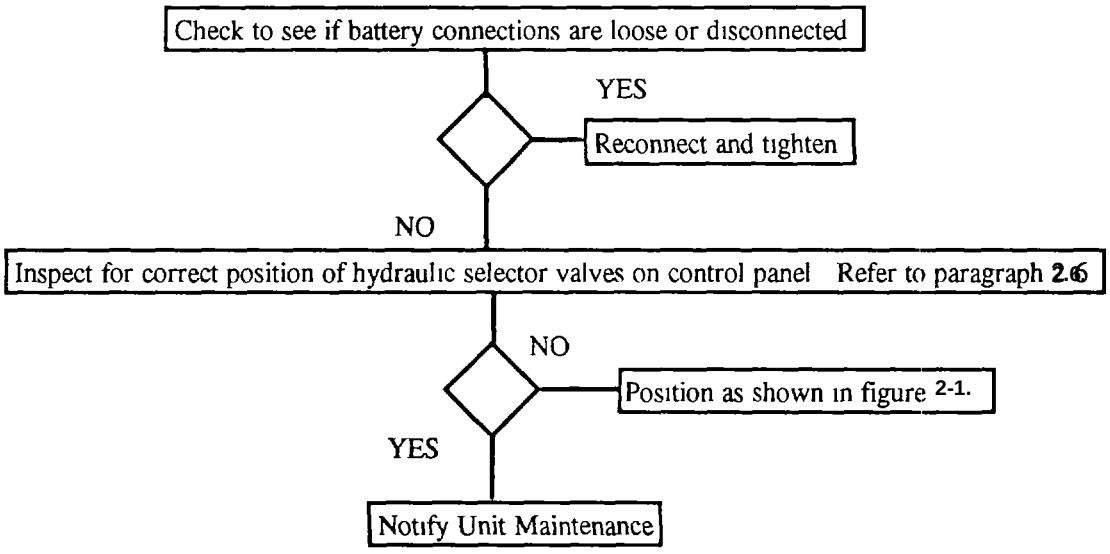
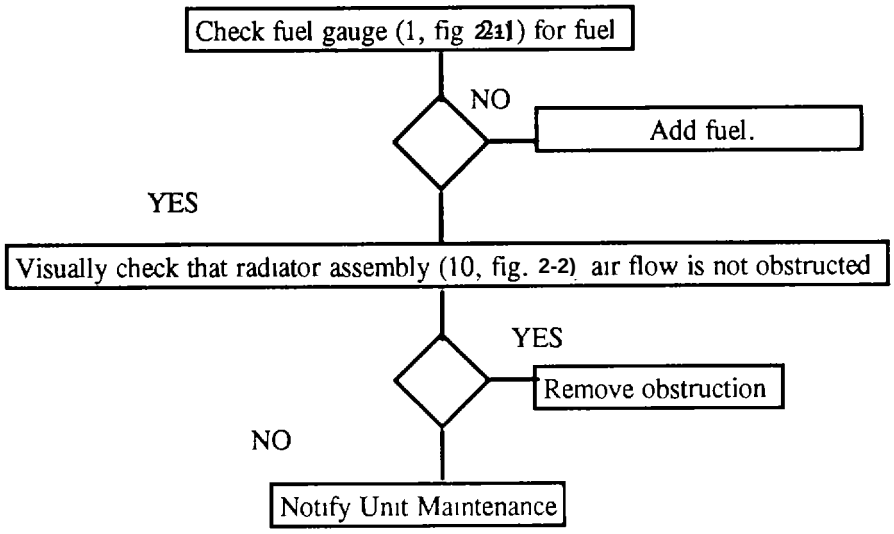

Check to see if battery connections are loose or disconnected
YES
Reconnect and tighten
NO
Inspect for correct position of hydraulic selector valves on control panel Refer to paragraph 2.6
NO
Position as shown in figure 2-1.
YES
Notify Unit Maintenance

TABLE 3-1. OPERATOR TROUBLESHOOTING (CONTINUED)

MALFUNCTION 2. STOPS SUDDENLY UNDER LOAD.



SECTION III. OPERATOR'S MAINTENANCE PROCEDURES

3.4 Operator's Maintenance Procedures. There are no maintenance procedures specific to operator maintenance.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

Page

SECTION I UNIT LUBRICATION INSTRUCTIONS 4-2

4.1 Lubrication Instructions 4-2
4.2 Engine Oil and Filter 4-3
4.3 Hydraulic Fluid and Filter 4-5

SECTION II REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT 4-7

4.4 Common Tools and Equipment 4-7
4.5 Special Tools, TMDE, and Support Equipment 4-7
4.6 Repair Parts 4-7

SECTION III SERVICE UPON RECEIPT 4-7

4.7 General 4-7
4.8 Preparation for Use 4-7
4.9 Battery 4-8

SECTION IV UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES 4-8

4.10 Introduction to PMCS Table 4-8
4.11 PMCS Procedures 4-8
4.12 PMCS Table 4-9

SECTION V UNIT TROUBLESHOOTING 4-10

4.13 Introduction 4-10
4.14 Troubleshooting Chart 4-10

SECTION VI UNIT MAINTENANCE PROCEDURES 4-20

4.15 Oil Pressure Override Switch 4-20
4.16 Cabinet Top Cover 4-21
4.17 Fuel Tank 4-22
4.18 Air Filter 4-23
4.19 Battery 4-24
4.20 Engine Radiator 4-25
4.21 Fan Belt 4-27
4.22 Thermostat 4-29
4.23 Fuel Filter 4-30
4.24 Fuel Control Solenoid 4-31
4.25 Alternator 4-32
4.26 Starter 4-33
4.27 Glow Plugs 4-34

SECTION VII PREPARATION FOR STORAGE AND SHIPMENT 4-35

4.28 Preparation for Storage and Shipment 4-35
4.29 Special Instructions for Administrative Storage 4-35

SECTION I. UNIT LUBRICATION INSTRUCTIONS

4.1 LUBRICATION INSTRUCTIONS.

NOTE

There are no grease points on this equipment.

4.1.1 The engine oil and hydraulic fluid filters shall be serviced/cleaned/changed as applicable when:

a. They are known to be contaminated or clogged;

b. Replacement is recommended by Army Oil Analysis Program (AOAP) laboratory analysis, or

c. At service interval time as prescribed in Table 4-1.

4.1.2 For equipment under manufacturer's warranty, service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (such as longer than usual operating hours, extended idling periods, extreme dust)

4.1.3 During normal operation the engine oil and hydraulic fluid shall be checked daily and maintained at the full level on the dipstick.

4.1.4 Engine oil grade selection. The temperatures given in Table 4-1 are the ambient temperatures at the time when the engine is started.

TABLE 4-1. Engine Lubrication Table.

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Grade	Capacity	Interval	Man-hours
Below -15°C/Below 5°F	NR NR MIL-L-461 52	5W/30	5.6 QTS.	250 H	.5
-15°C to 4°C/5°F to 39°F	OE/HDO-10 0-237 MIL-L-2104B	10W	5.6 QTS.	250 H	.5
5°C to 30°C/40° to 86°F	OE/HDO-15/40 0-237 MIL-L-2104B	15W/40	5.6 QTS.	250 H	.5
Above 31°C/Above 86°F	OE/HDO-30 MIL-L-2104B	30W	5.6 QTS.	125 H	.5

4.2 ENGINE OIL AND FILTER - INSPECT, REPLACE.

THIS TASK CONSISTS OF a. Checking oil level b. Oil draining c. Filter removal d. Filter installation e. Oil filling

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair.
Organization Maintenance, Common No 1, less power
(item 6, Section m, Appendix B)

Equipment Condition:
Side panels removed.
Engine stopped and cool.

General Safety Requirements:

WARNING

Petroleum oils are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE

Material/Parts Required
0il filter, Item 16, Appendix E.
Grease, Item 11, Appendix E.
Oil, item 2, 3 or 4, Appendix E.

CAUTION

Avoid spilling of fuel or fluids. Clean up minor spills immediately. For large spills, notify your supervisor.

a. Checking oil level. Refer to figure 4-1.

1) Remove dipstick (3), wipe clean then reinsert.

2) Remove dipstick (3) again. Oil level should be between marks on dipstick. The distance between the marks represents 1.26 quarts/1 2 liters.

3) Replace dipstick.

b. Oil draining. Refer to figure 4-1.

1) Raise the hydraulic power supply high enough to put the waste oil container underneath.

2) Remove the drain plug (1) allowing the oil to drain in to the container. Install the plug when all the oil has drained.

3) Examine the waste oil for evidence of metal particles which would indicate possible engine failure. Dispose of the oil in accordance with local Standard Operating Procedures.

c. Filter removal. Refer to figure 4-1

1) The full flow oil filter (4) is a disposable spin-on cartridge type located on the left side of the engine crankcase. To remove the filter, turn filter counter clockwise using a band type filter wrench.

d. Filter installation. Refer to figure 4-1.

1) Apply thin coat of grease or oil to the rubber gasket on the new filter (4).

2) Turn the new filter clockwise on to the crankcase filter adapter until the rubber gasket just makes contact with the crankcase sealing face (5).

3) Turn the filter (4) clockwise on a further 1/4 to 1/2 turn.

4) Dispose of the used filter In accordance with local SOP.

e. Oil filling. Refer to figure 4-1.

1) Fill the engine with the correct grade of oil for the operating conditions. See Table 4-1 for oil grade selection. Add oil through the filler (2) to the full line on the dipstick (3). The engine oil capacity is 5.6 quarts/5 3 liters excluding the filter. The capacity between dipstick marks is 1.26 quarts/1.2 liters. The filter capacity is 0.49 pints/0 23 liters.

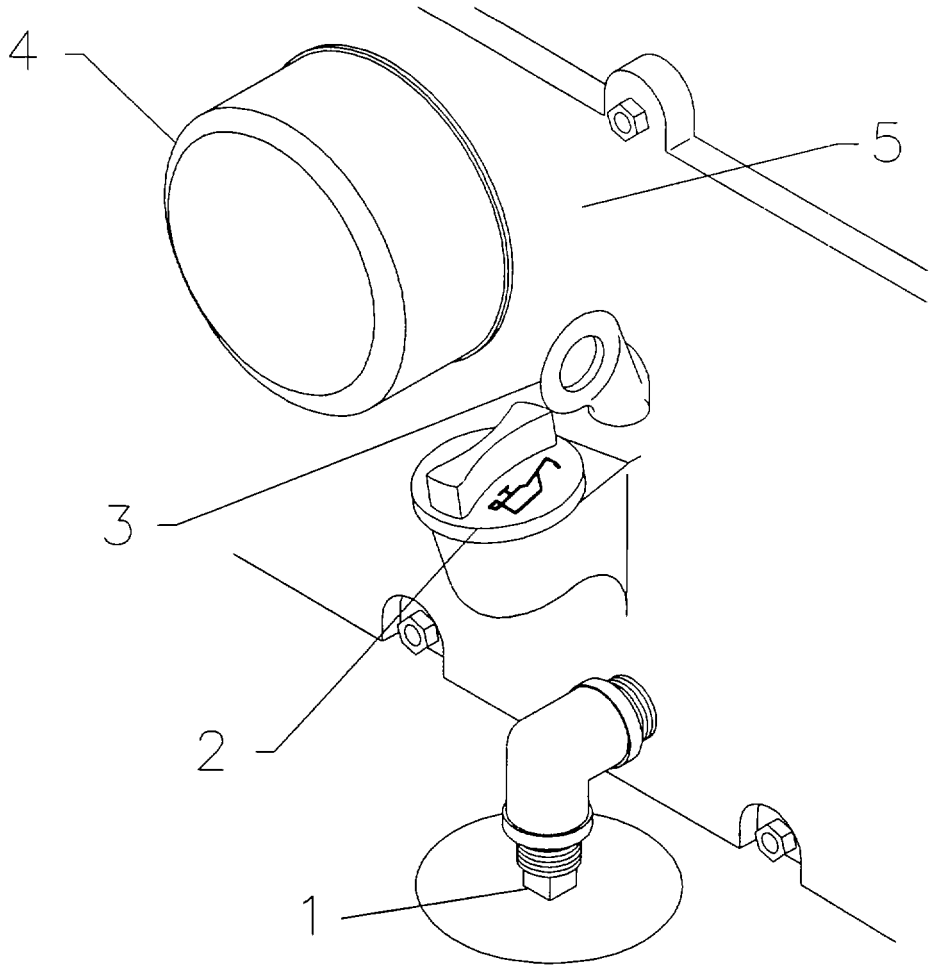


Figure 4-1. Engine Oil and Filter Change.

4.3 HYDRAULIC FLUID AND FILTER - INSPECT, REPLACE.

THIS TASK CONSISTS OF. a. Checking fluid level b. Fluid draining c. Fluid filling
d. Filter removal e. Filter installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organization Maintenance, Common No. 1, less power (item 6, Section III, Section III, Appendix B).

Equipment Condition:
Hydraulic fluid tank access cap (1) removed.
Engine stopped and cool.

General Safety Requirements:

WARNING

Hydraulic fluids are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE.

Material/Parts Required
Hydraulic fluid filter, item 15, Appendix E.
Lubricating oil, item 7, Appendix E.
Hydraulic oil, item 8, Appendix E.

a. Checking fluid level. Refer to figure 4-2.

1) Remove dipstick (3), wipe clean then reinsert.

2) Remove dipstick (3) again. Fluid level should be between marks on dipstick. The distance between the marks represents approximately 4 gallons/15.1 liters. Filling to the top mark represents the full capacity of 25 gallons/94.6 liters.

3) Replace dipstick (3).

b. Fluid draining. Refer to figure 4-2.

1) Raise the hydraulic power supply high enough to put the waste fluid container underneath.

2) Turn the drain valve handle (4) counter clockwise allowing the hydraulic fluid to drain in to the waste fluid container. Turn the drain valve handle fully clockwise to close the drain valve after all the fluid has drained.

3) Examine the waste fluid for evidence of metal particles which would indicate possible pump failure. Dispose of the fluid in accordance with local SOP.

c. Filling. Refer to figure 4-2.

1) Remove filler cap (2).

2) Add fluid through the filler to the full line on the dipstick (3). The hydraulic fluid tank capacity is 25 gallons/94.6 liters.

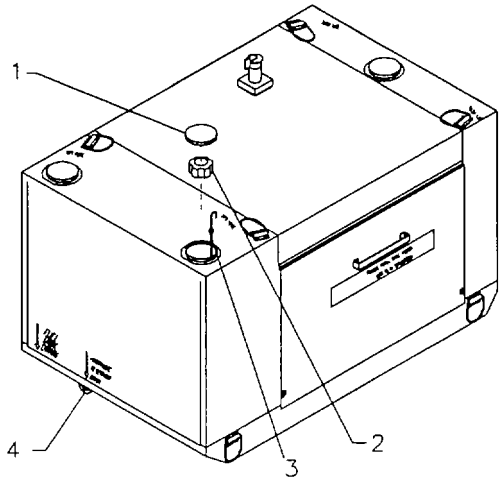


Figure 4-2. Hydraulic Fluid Level Check.

d. Filter removal. Refer to figure 4-3.

1) The hydraulic fluid filter (1) is a disposable spin-on cartridge type filter located inside the housing at the front of the hydraulic fluid tank. To remove the filter, turn counter clockwise using a band type filter wrench.

2) Dispose of in accordance with local SOP.

e. Filter installation. Refer to figure 4-3.

1) Apply a thin coat of oil to the rubber gasket on the new filter.

2) Turn the new filter (1) clockwise to the filter housing (2) until the rubber gasket just makes contact with the housing sealing face.

3) Turn the filter (1) another 1/4 to 1/2 turn.

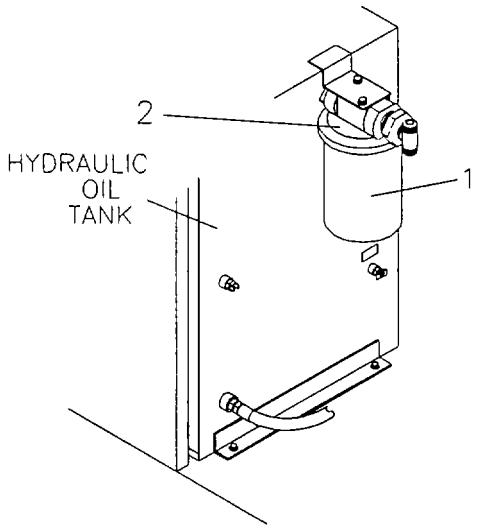


Figure 4-3. Hydraulic Oil Filter.

SECTION II. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT.

4.4 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your hydraulic power supply. General Mechanics Tool Kit, item 5, Section m, Appendix B, and Shop Equipment, Automotive Maintenance and Repair: Organization Maintenance, Common No. 1, less power, item 6, Section III, Appendix B are required for unit maintenance tasks described in this manual.

4.5 Special Tools, TMDE, and Support Equipment. Refer to Appendix B, Maintenance Allocation Chart, Section III, for special tools and test equipment. Special tools, TMDE and support equipment for the hydraulic power supply are also contained in Repair Parts and Special Tools List TM 5-1730-245-24P.

4.6 Repair Parts. Refer to Appendix I for mandatory replacement parts listing Repair parts are listed and illustrated in Repair Parts and Special Tools List TM 5-1730-245-24P covering maintenance for this equipment.

SECTION III. SERVICE UPON RECEIPT

4.7 GENERAL. Visually check the exterior of the hydraulic power supply for any apparent damage such as large dents, broken latches, loose or missing hardware, etc

4.8 PREPARATION FOR USE.

a. Remove the two side panels (8, fig 1-2) and the front radiator panel (5, fig 1-2). These panels are held in place by two 1/4 turn fasteners (7, fig 1-2). Store these panels near the hydraulic power supply The panels are to remain off during engine operation.

b. Remove the engine retaining wooden spacers (9, fig 4-4). A steel bracket (3) is bolted to the front of the engine and to the base to retain the engine during shipment. Remove the two lockwashers (1) and screws (2) holding the steel bracket (2) to the engine and the two bolts (4), lockwashers (5) and nuts (6) holding the steel bracket (3) to the base. Remove the steel bracket (3). A steel strap (10) and wooden spacer (9) are used to retain each of the two rear shock mounts. Remove the two bolts (11), lockwashers (8) and nuts (7) holding the wooden spacers (9) and remove the wooden spacers (9). The steel straps (10) may be left In position on the rear shock mounts. Save the wooden spacers (9), steel bracket (3), bolts (11 and 4), nuts (7), and screws (2) for use in preparing the hydraulic power supply for reshipment.

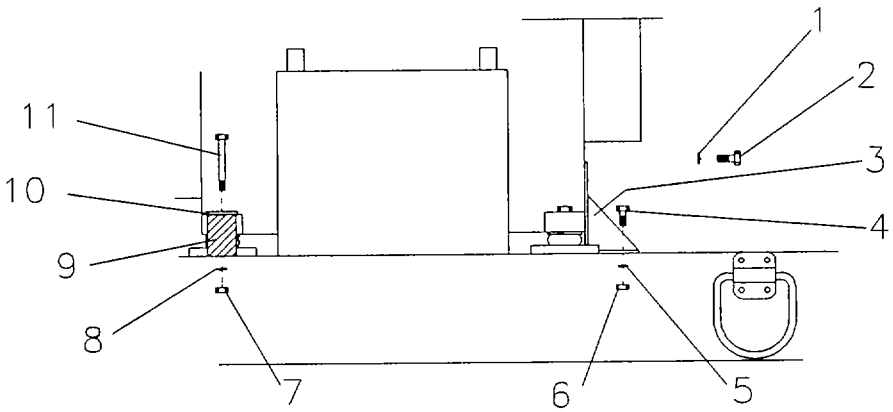


Figure 4-4. Engine Retainers..

WARNING

Fuels and oils are toxic and flammable. Do not use near heat or open flame. Area should be well ventilated. DO NOT SMOKE.

WARNING

Coolant/antifreeze is toxic. Avoid spilling of coolant/antifreeze, fuel or fluids. Clean up minor spills immediately. For large spills, notify your supervisor.

c. Add coolant/antifreeze to engine radiator. The capacity is 2.0 gallons/7.57 liters. Refer to paragraph 4.20.

d. Add engine oil to the full mark on dipstick. Refer to paragraph 4.2.

e. Fill the engine fuel tank. Use diesel fuel, item 5 or 6, Appendix E. Refer to paragraph 4.17.

f. Fill the hydraulic fluid tank with hydraulic fluid. Refer to paragraph 4.3.

g. Visually scan the interior of the engine compartment for possible loose or unserviceable components.

4.9 BATTERY. Remove caps from top of battery and check electrolyte level. If battery is dry, fill with electrolyte (item 10, Appendix E). If some electrolyte is visible but does not cover battery plates, fill with distilled water (item 19, Appendix E) to cover plates.

SECTION IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4.10 INTRODUCTION TO PMCS TABLE

4.10.1. GENERAL. To ensure that the hydraulic power supply is ready for use at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or equipment failure.

NOTE

Ensure that all operator PMCS has been performed prior to performing unit PMCS.

4.11 PMCS PROCEDURES. Preventive Maintenance Checks and Services, Table 4-2, lists inspections and are required to keep equipment in good operating condition.

a. The "ITEM NUMBER COLUMN" of Table 4-2 is the order in which you perform checks and services on the hydraulic power supply The entry in this column will also be used as a source of item numbers for the "TM Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

b. The "INTERVAL" column of Table 4-2 tells you when to do a certain check or service.

c. The "LOCATION, ITEM TO CHECK/SERVICE" column of Table 4-2 tells you the name of the item to be checked or serviced and where the item is located.

d. The "PROCEDURE" column of Table 4-2 tells you how to perform the required checks and services. Follow these instructions carefully.

e. The "NOT FULLY MISSION CAPABLE IF:" column is the column of Table 4-2 in which entries will be keyed specifically to checks listed in the "procedures" column for the purpose of identifying, for the check, the criteria that will cause the equipment to be classified as not ready/available because of inability to perform its primary Combat Mission. An entry in this column will:

a. Identify conditions that make the equipment not fully mission capable for readiness reporting.

b. Deny use of the equipment until corrective maintenance has been performed

4.12 PMCS Table. The necessary preventive maintenance services to be performed are listed and described in Table 4-2. Defects discovered during operation of the system should be corrected as soon as possible. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) as soon as possible.

TABLE 4-2. Unit Preventive Maintenance Checks and Services.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
1	125 hours	Engine Oil and Filter	Drain and refill. Refer to Paragraph 4.2.	Oil dirty.
2	125 hours	Hydraulic Fluid Filter	Replace whenever fluid is drained or after component/tool failure Refer to paragraph 4.3.	Clogged filter Is permitting dirty fluid to bypass.
3	125 hours	Air Cleaner	Clean element with compressed air.	Element clogged.
4	250 hours	Air Cleaner	Replace element..	Element clogged.
5	500 hours	Fuel Filter	Replace element Refer to paragraph 4.23.	Element clogged.
6	500 hours	Engine Shockmounts	Inspect for deterioration. Report to Direct Support Maintenance.	Deteriorated rubber.
7	2000 hours	Fan Belt	Replace.	

NOTE

Tension on a new radiator fan belt should be checked after installation and after the first 25 hours of operation Refer to paragraph 4.21.

SECTION V. UNIT TROUBLESHOOTING

4.13 INTRODUCTION. This section provides information useful in the diagnosis and correction of problems or failures that may be encountered in the operation of the hydraulic power supply. Troubleshooting is performed whenever the hydraulic power supply is not functioning properly. Failures and malfunctions may often be traced to relatively simple causes. Table 4-4 is a trouble analysis chart for the operator of the hydraulic power supply. The chart contains a listing of the troubles that might be encountered, the probable cause of the trouble and action that may be taken to correct the condition.

4.14 TROUBLESHOOTING CHART. Refer to table 4-4.

4.14.1 Table 4-4 lists common malfunctions that you may find with the hydraulic power supply. Perform the tests, inspections and corrective actions in the order they appear in the table. This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor, or next level of maintenance For quick access to troubleshooting procedures, refer to Table 4-3, Malfunction Index.

TABLE 4-3. Malfunction Index.

	MALFUNCTION	PAGE
1.	Engine Won't Crank	4-11
2.	Engine Cranks But Won't Start	4-12
3.	Stops Under Load	4-13
4.	Fails to Deliver Full Power	4-14
5.	Low Hydraulic Pressure	4-15
6.	Engine Stops When Override Switch Is Released	4-16
7.	Engine Overheats	4-17
8.	Black Smoke From Exhaust	4-18

TABLE 4-4. UNIT TROUBLESHOOTING.

MALFUNCTION 1. ENGINE WON'T CRANK OVER.

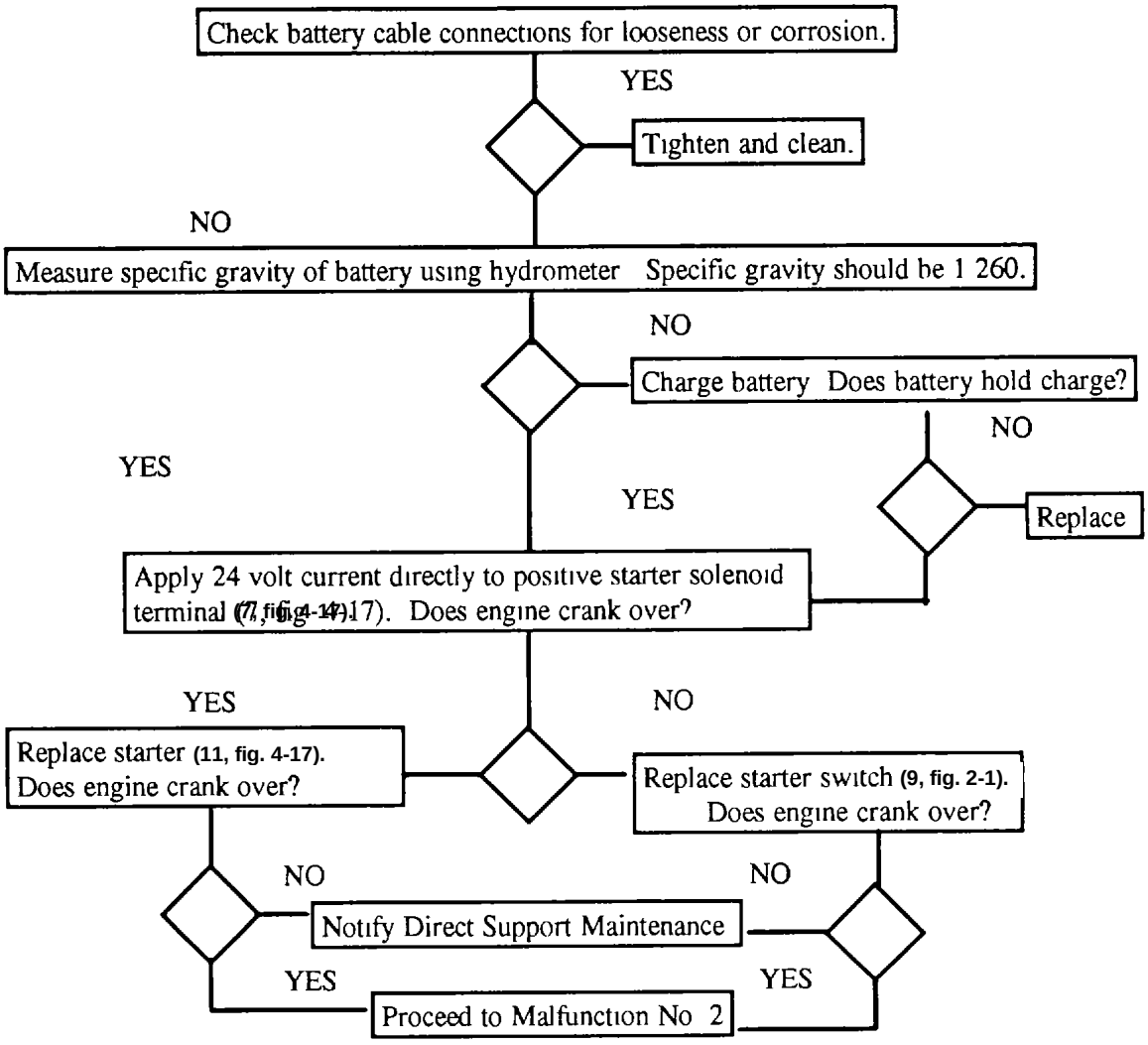
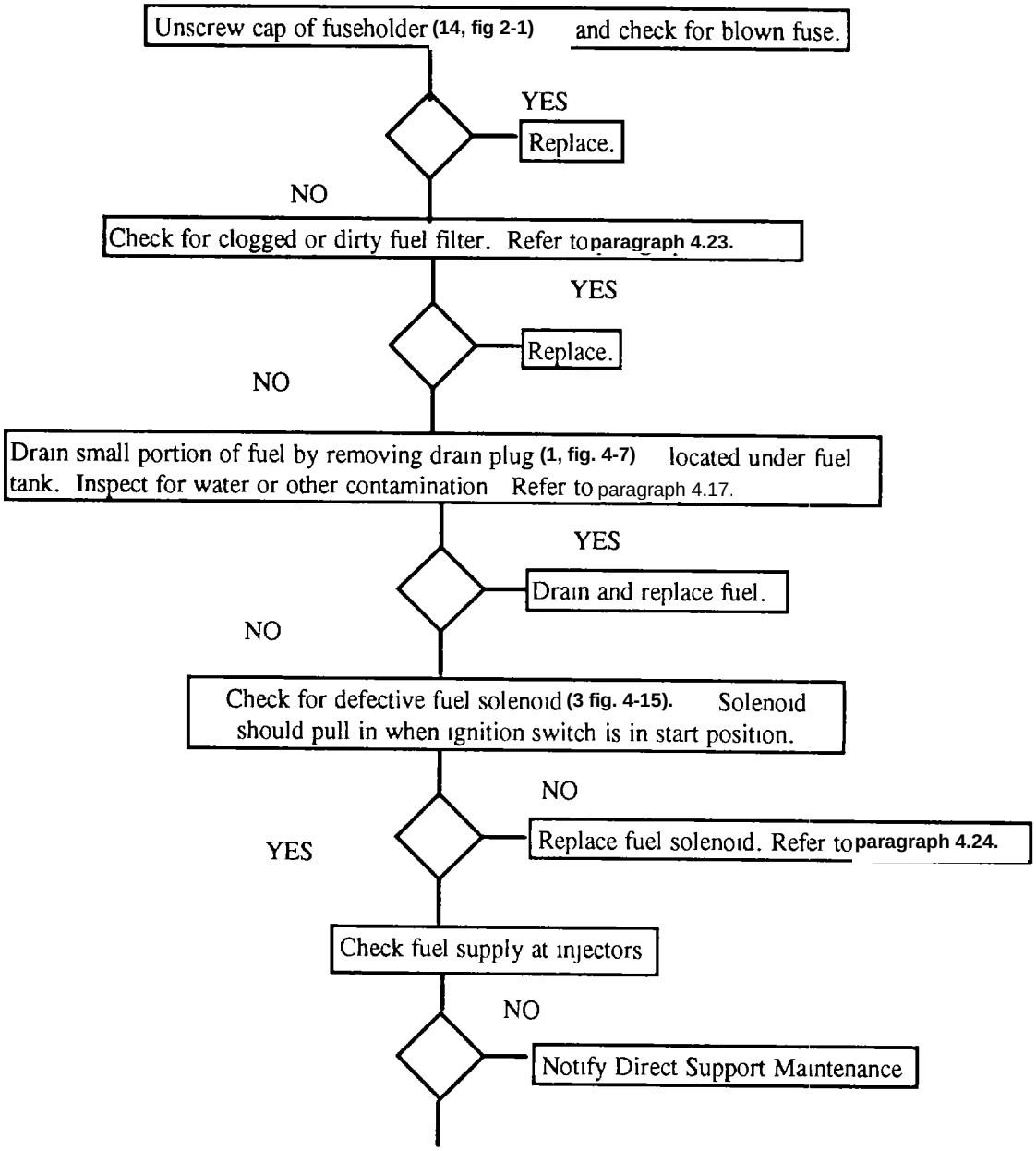

Check battery cable connections for looseness or corrosion.
YES
Tighten and clean.
NO
Measure specific gravity of battery using hydrometer Specific gravity should be 1 260.
NO
Charge battery Does battery hold charge?
NO
YES
YES
Replace
Apply 24 volt current directly to positive starter solenoid terminal (7, fig. 4-17). Does engine crank over?
YES
NO
Replace starter (11, fig. 4-17). Does engine crank over?
Replace starter switch (9, fig. 2-1). Does engine crank over?
NO
NO
Notify Direct Support Maintenance
YES
YES
Proceed to Malfunction No 2

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

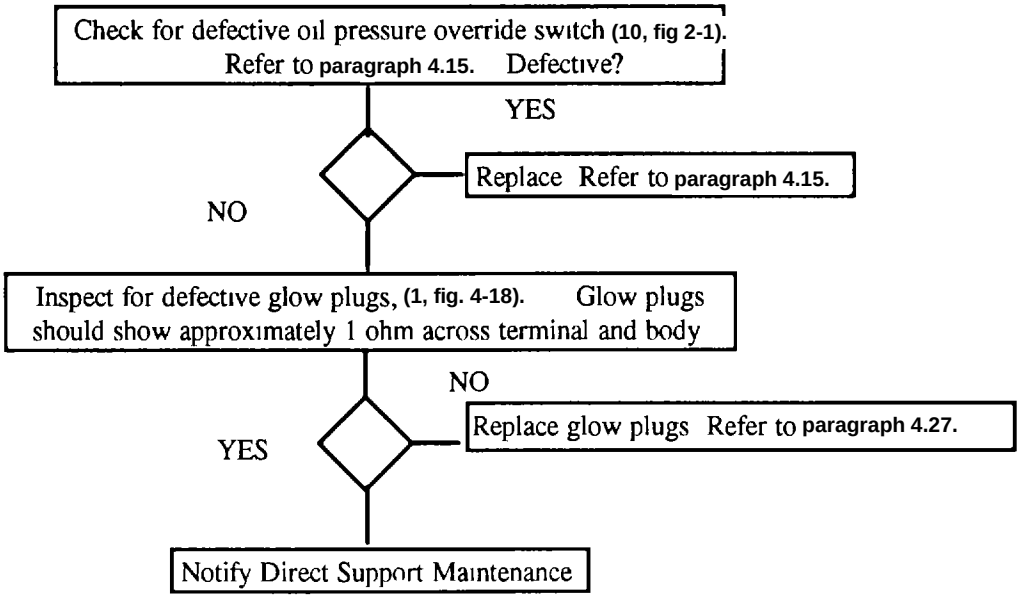
MALFUNCTION 2. ENGINE CRANKS BUT WON'T START


Unscrew cap of fuseholder (14, fig 2-1) and check for blown fuse.
YES
Replace.
NO
Check for clogged or dirty fuel filter. Refer to paragraph 4.23.
YES
Replace.
NO
Drain small portion of fuel by removing drain plug (1, fig. 4-7) located under fuel tank. Inspect for water or other contamination Refer to paragraph 4.17.
YES
Drain and replace fuel.
NO
Check for defective fuel solenoid (3 fig. 4-15). Solenoid should pull in when ignition switch is in start position.
NO
Replace fuel solenoid. Refer to paragraph 4.24.
YES
Check fuel supply at injectors
NO
Notify Direct Support Maintenance

Continued next Page

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 2. ENGINE CRANKS BUT WON'T START (CONT'D)


Check for defective oil pressure override switch (10, fig 2-1). Refer to paragraph 4.15. Defective?
YES
Replace Refer to paragraph 4.15.
NO
Inspect for defective glow plugs, (1, fig. 4-18). Glow plugs should show approximately 1 ohm across terminal and body
NO
Replace glow plugs Refer to paragraph 4.27.
YES
Notify Direct Support Maintenance

MALFUNCTION 3. STOPS UNDER LOAD

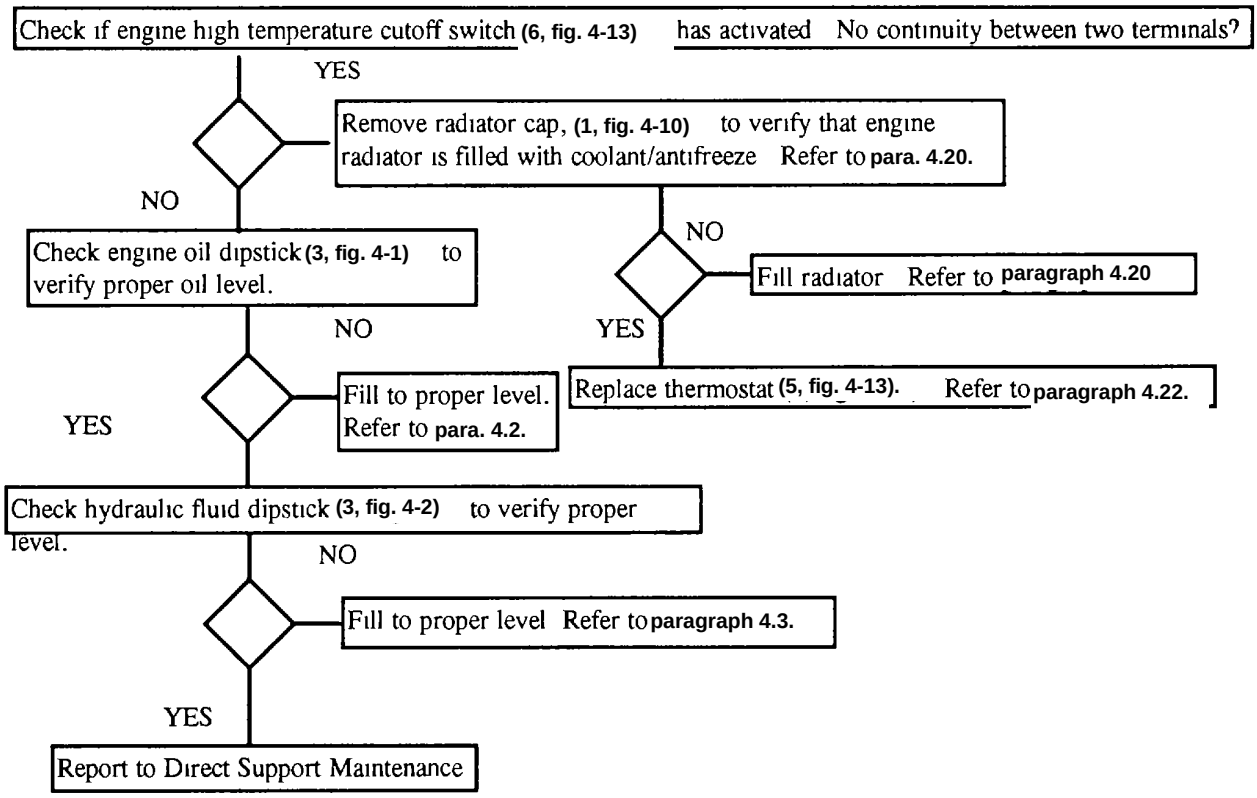

Check if engine high temperature cutoff switch (6, fig. 4-13) has activated No continuity between two terminals?
YES
Remove radiator cap, (1, fig. 4-10) to verify that engine radiator is filled with coolant/antifreeze Refer to para. 4.20.
NO
Check engine oil dipstick (3, fig. 4-1) to verify proper oil level.
NO
Fill radiator Refer to paragraph 4.20
YES
Replace thermostat (5, fig. 4-13). Refer to paragraph 4.22.
YES
Fill to proper level. Refer to para. 4.2.
Check hydraulic fluid dipstick (3, fig. 4-2) to verify proper level.
NO
Fill to proper level Refer to paragraph 4.3.
YES
Report to Direct Support Maintenance

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 4. FAILS TO DELIVER FULL POWER

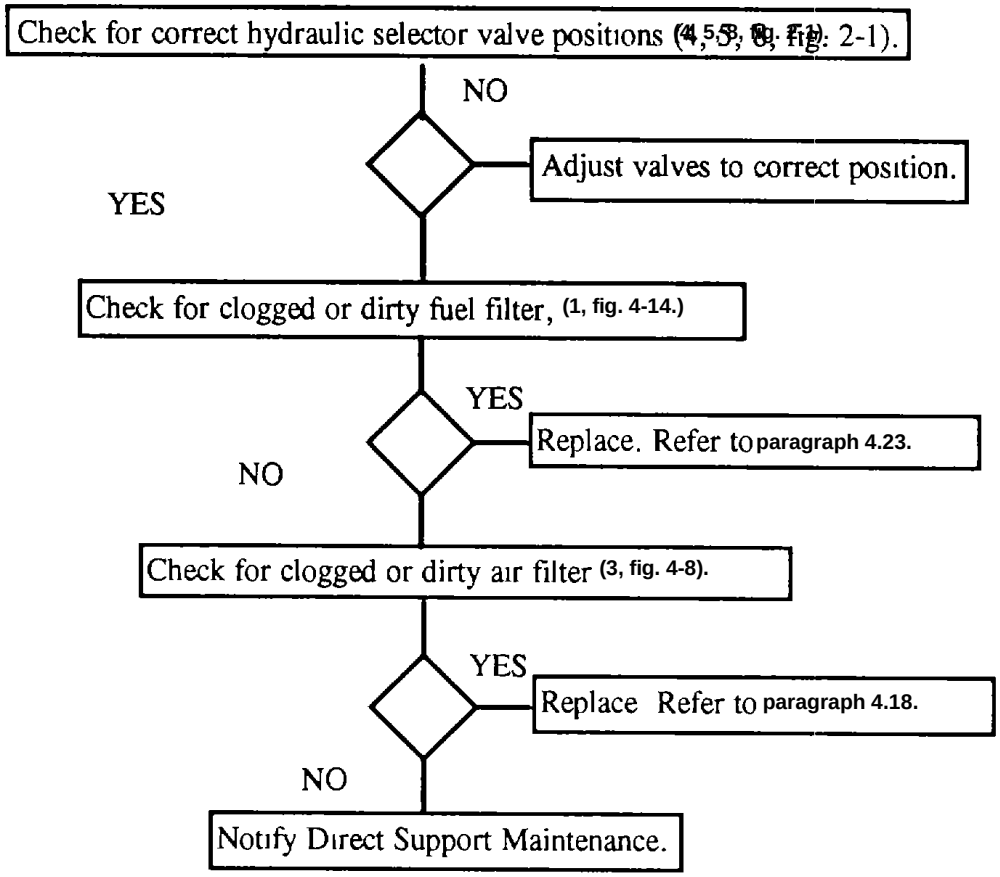

Check for correct hydraulic selector valve positions (4, 5, 8, fig. 2-1).
NO
Adjust valves to correct position.
YES
Check for clogged or dirty fuel filter, (1, fig. 4-14.)
YES
Replace. Refer to paragraph 4.23.
NO
Check for clogged or dirty air filter (3, fig. 4-8).
YES
Replace Refer to paragraph 4.18.
NO
Notify Direct Support Maintenance.

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 5. LOW HYDRAULIC PRESSURE

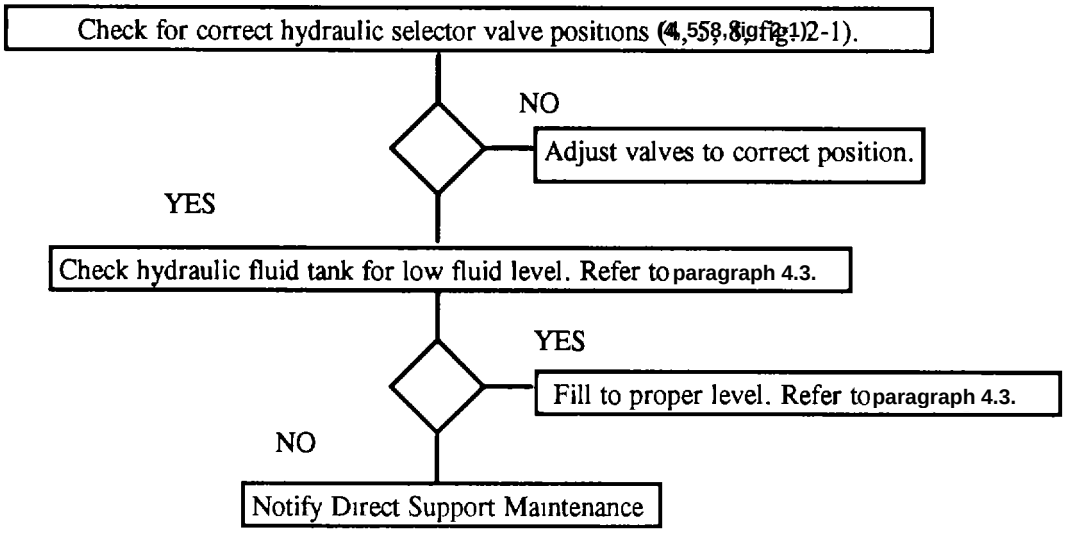

Check for correct hydraulic selector valve positions (4,5,8, fig 2-1).
NO
Adjust valves to correct position.
YES
Check hydraulic fluid tank for low fluid level. Refer to paragraph 4.3.
YES
Fill to proper level. Refer to paragraph 4.3.
NO
Notify Direct Support Maintenance

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 6. ENGINE STOPS WHEN OIL PRESSURE OVERRIDE SWITCH IS RELEASED

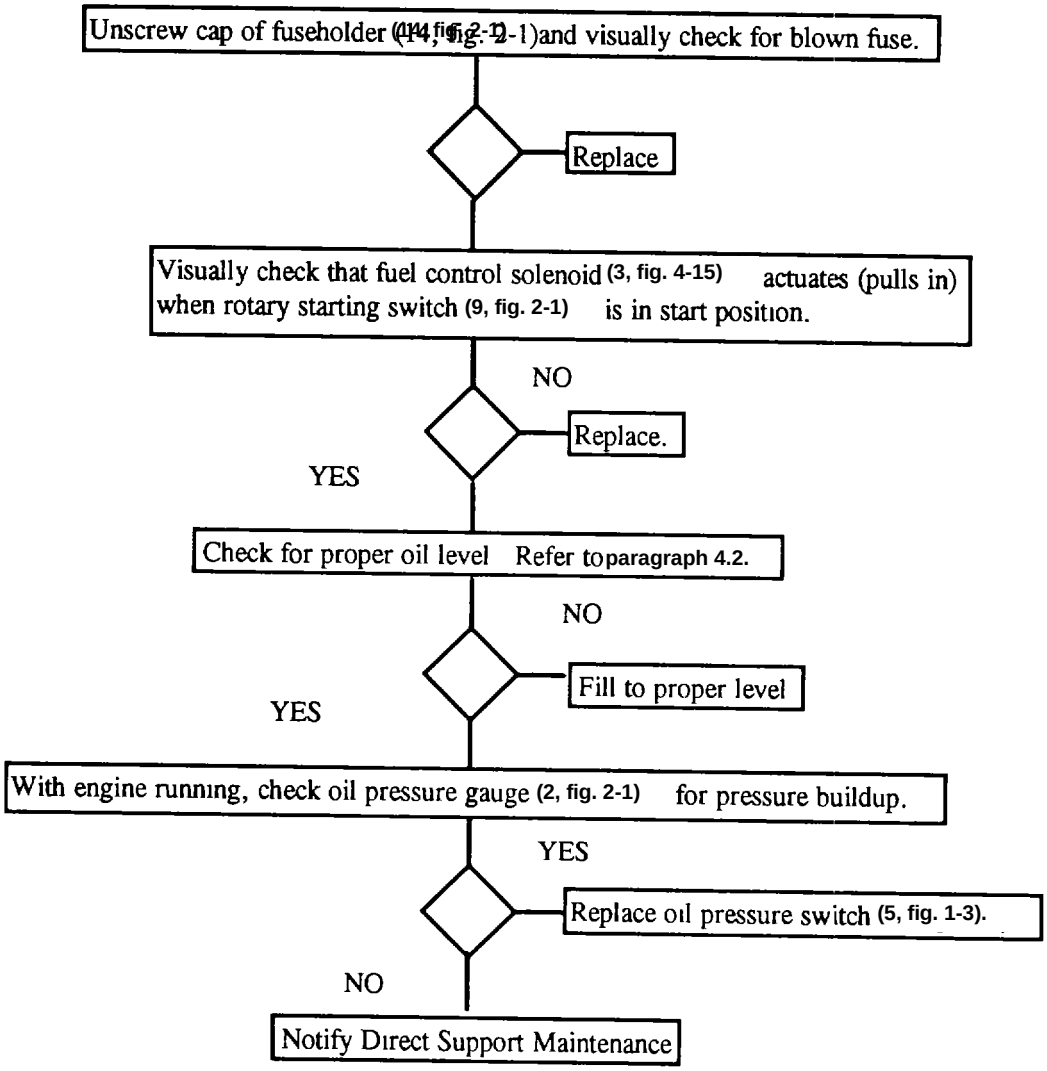

Unscrew cap of fuseholder (14, fig. 2-1) and visually check for blown fuse.
Replace
Visually check that fuel control solenoid (3, fig. 4-15) actuates (pulls in) when rotary starting switch (9, fig. 2-1) is in start position.
NO
Replace.
YES
Check for proper oil level Refer to paragraph 4.2.
NO
Fill to proper level
YES
With engine running, check oil pressure gauge (2, fig. 2-1) for pressure buildup.
YES
Replace oil pressure switch (5, fig. 1-3).
NO
Notify Direct Support Maintenance

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 7. ENGINE OVERHEATS

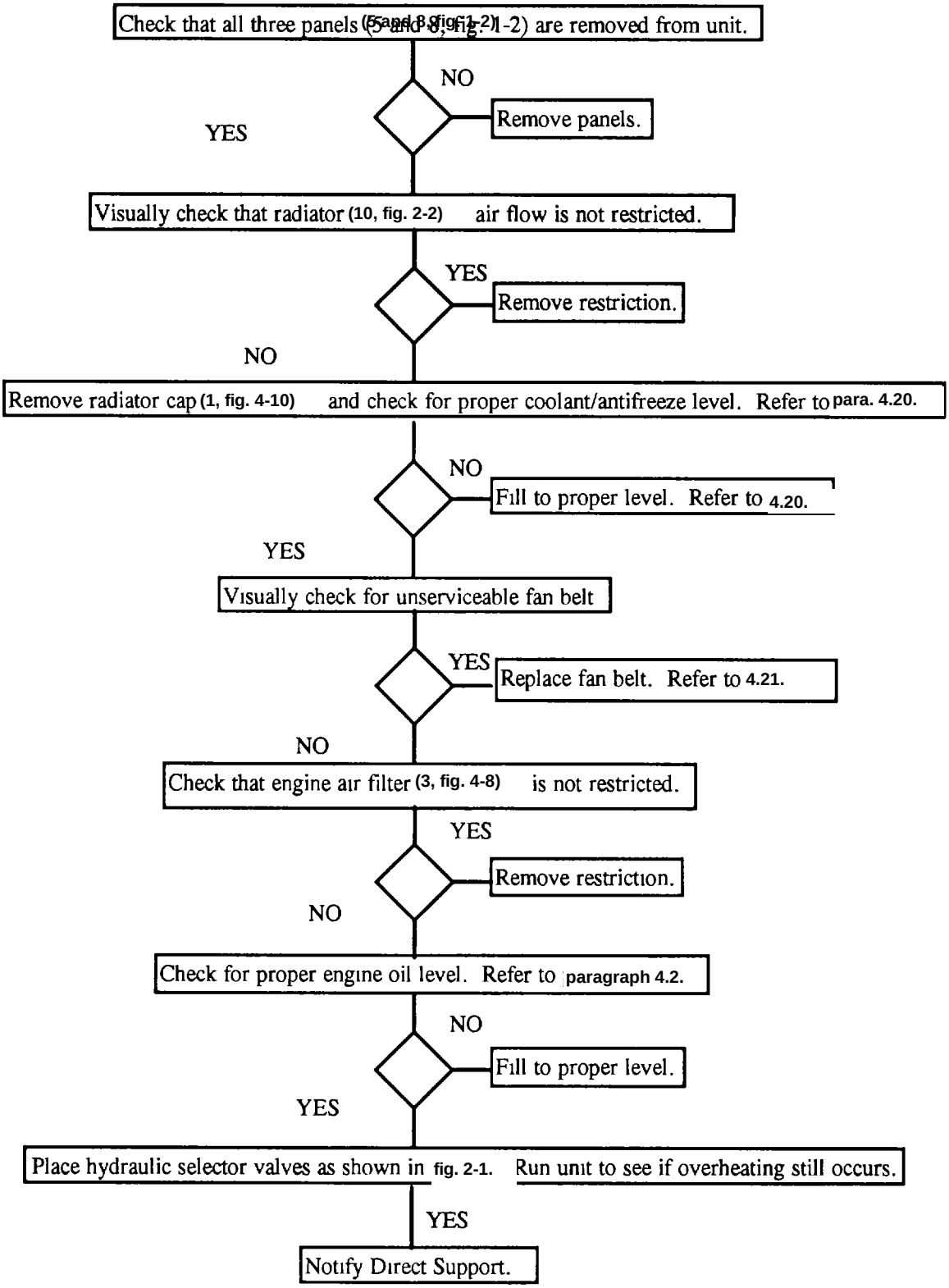

Check that all three panels (5 and 8, fig. 1-2) are removed from unit.
NO
Remove panels.
YES
Visually check that radiator (10, fig. 2-2) air flow is not restricted.
YES
Remove restriction.
NO
Remove radiator cap (1, fig. 4-10) and check for proper coolant/antifreeze level. Refer to para. 4.20.
NO
Fill to proper level. Refer to 4.20.
YES
Visually check for unserviceable fan belt
YES
Replace fan belt. Refer to 4.21.
NO
Check that engine air filter (3, fig. 4-8) is not restricted.
YES
Remove restriction.
NO
Check for proper engine oil level. Refer to paragraph 4.2.
NO
Fill to proper level.
YES
Place hydraulic selector valves as shown in fig. 2-1. Run unit to see if overheating still occurs.
YES
Notify Direct Support.

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 8. BLACK SMOKE FROM EXHAUST

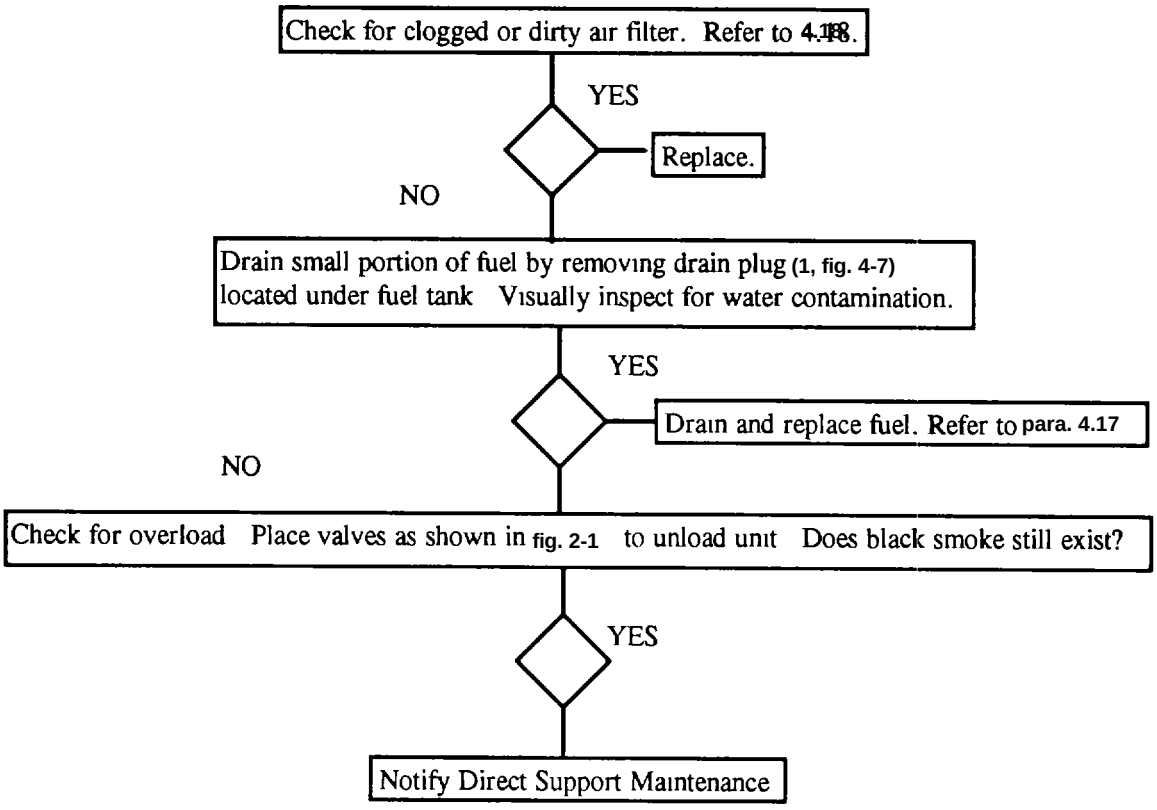
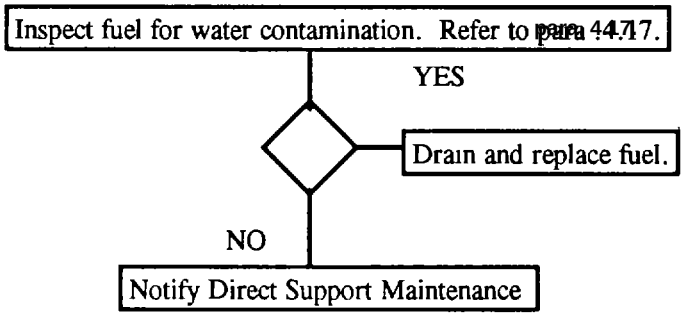

Check for clogged or dirty air filter. Refer to 4.18.
YES
Replace.
NO
Drain small portion of fuel by removing drain plug (1, fig. 4-7) located under fuel tank Visually inspect for water contamination.
YES
Drain and replace fuel. Refer to para. 4.17
NO
Check for overload Place valves as shown in fig. 2-1 to unload unit Does black smoke still exist?
YES
Notify Direct Support Maintenance

TABLE 4-4. UNIT TROUBLESHOOTING. (CONTINUED)

MALFUNCTION 9. WHITE SMOKE FROM EXHAUST



SECTION VI. UNIT MAINTENANCE PROCEDURES

4.15 OIL PRESSURE OVERRIDE SWITCH - INSPECT, REPLACE.

THIS TASK CONSISTS OF a. Testing b. Removal c. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organization Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. See paragraph 4.19.
Top cover removed (4, fig. 4-6). Refer to para. 4.16.

a. Testing. Refer to figure 4-5.

1) Using continuity tester (part of item 6, Section III, Appendix B), check for continuity between terminals (7) and (8) when pushbutton (6) is depressed. If there is no continuity when pushbutton is depressed, oil pressure override switch (2) is defective and must be replaced.

b. Removal. Refer to figure 4-5.

1) Tag and remove the wires (1) connected to oil pressure override switch (2).
2) Loosen locknut (3), remove retainer nut (4) and withdraw oil pressure override switch (2) from rear of panel (5).

c. Installation. Refer to figure 4-5.

1) Insert oil pressure override switch (2) through rear of panel (5), install retainer nut (4) and tighten locknut (3).
2) Install wires (1) to switch (2).

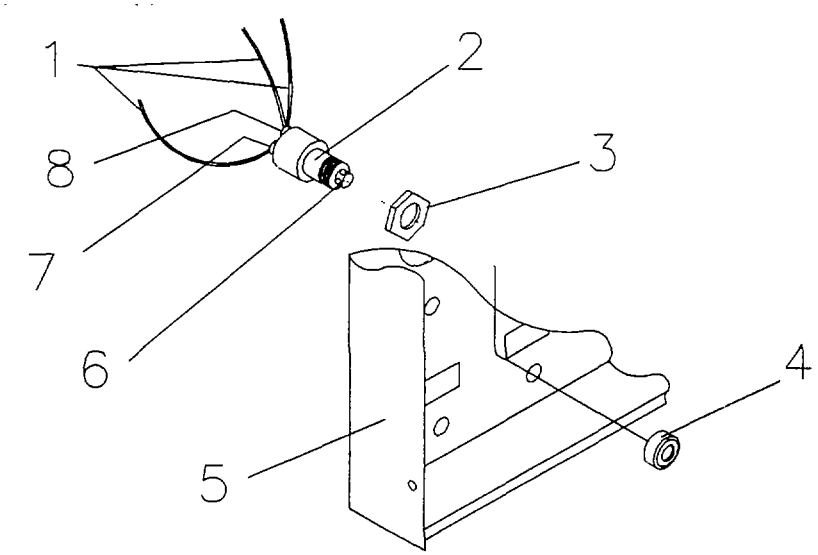


Figure 4-5. Oil Pressure Override Switch.

4.16 CABINET TOP COVER - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.

Material/Parts Required:
Caulking material (item 12, Appendix E)

a. Removal. Refer to figure 4-6.

1) Loosen the clamp bolt (1) on the muffler cap (6) Remove the cap (6).

2) Remove the four screws (2) holding the rain shield (5) In place and remove the rain shield

3) Remove the twenty two screws (3) holding the cover (4) and lift off the cover. Latex caulking material (item 12, Appendix E) is used as a gasket material on the cover to provide water-tightness.

b. Installation. Refer to figure 4-6.

1) To install the cover (4) apply a bead of latex caulk (Item 12, Appendix E) around the seating surface and replace the cover (4) with the 22 screws (3)

2) Install the rain shield (5) with the four screws (2).

3) Install the muffler cap (6) and tighten the clamp bolt (1).

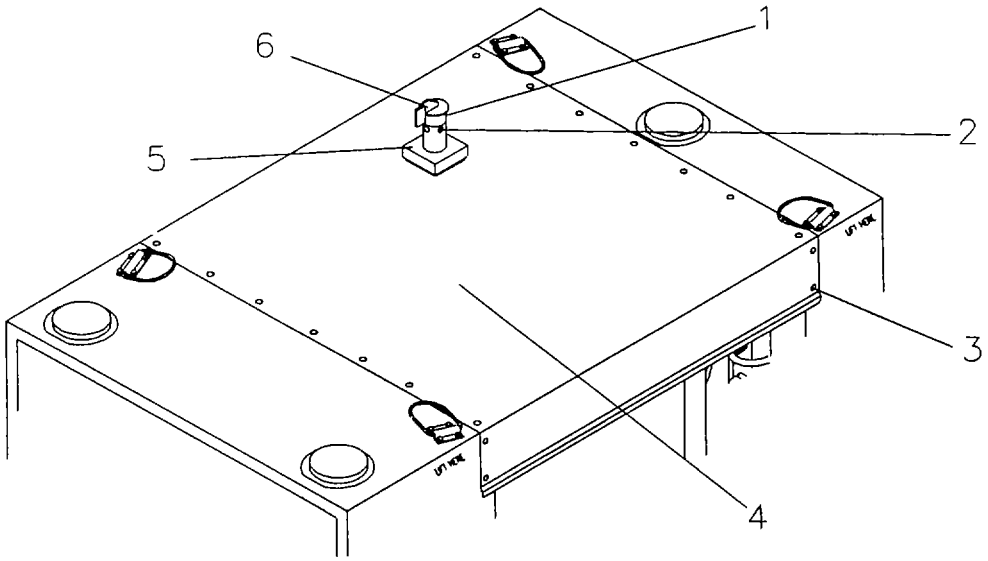


Figure 4-6. Top Cover.

4.17 FUEL TANK - SERVICE.

THIS TASK CONSISTS OF: a. Draining the fuel tank b. Refilling the fuel tank

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).

Material/Parts Required:
Fuel, item 5 or 6, Appendix E

General Safety Requirements:

WARNING

Fuels are toxic and flammable. Do not use near heat or open flame. Area should be well ventilated. DO NOT SMOKE.

a. Draining. Refer to figure 4-7.

1) Connect suitable sling to lifting rings (4) to raise and block the hydraulic power supply enough to place waste container underneath

2) Place suitable waste container under drain plug (1). Capacity of fuel tank is 10 gallons.

3) Remove drain plug (1) allowing fuel to drain in to the container. Install drain plug (1) when all the fuel has drained.

4) Dispose of waste fuel in accordance with local Standard Operating Procedures (SOP)

b. Refilling. Refer to figure 4-7.

1) Remove rain cap (3). Remove fuel cap (2) and fill with proper fuel

2) Remove waste container

3) Raise hydraulic power supply and remove blocks.

4) Remove sling.

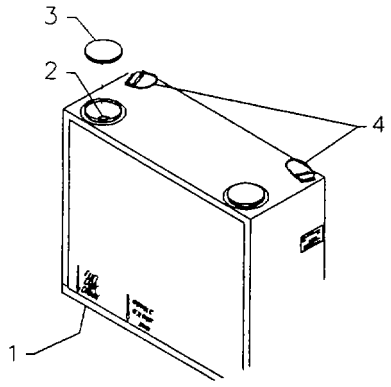


Figure 4-7. Fuel Tank Service.

4.18 AIR FILTER - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).

Equipment Condition:
Front panel (5, fig. 1-2) removed.

Material/Parts Required:
Air filter, item 9, Appendix I.

a. Removal. Refer to figure 4-8.

1) Loosen clamp (2) by turning screw counter clockwise.

2) Remove old filter (3) from intake nipple (1) and discard in accordance with local SOP

3) Retain clamp (2).

b. Installation. Refer to figure 4-8.

1) Install a new filter (3) to intake nipple (1) Tighten clamp (2) by turning screw clockwise

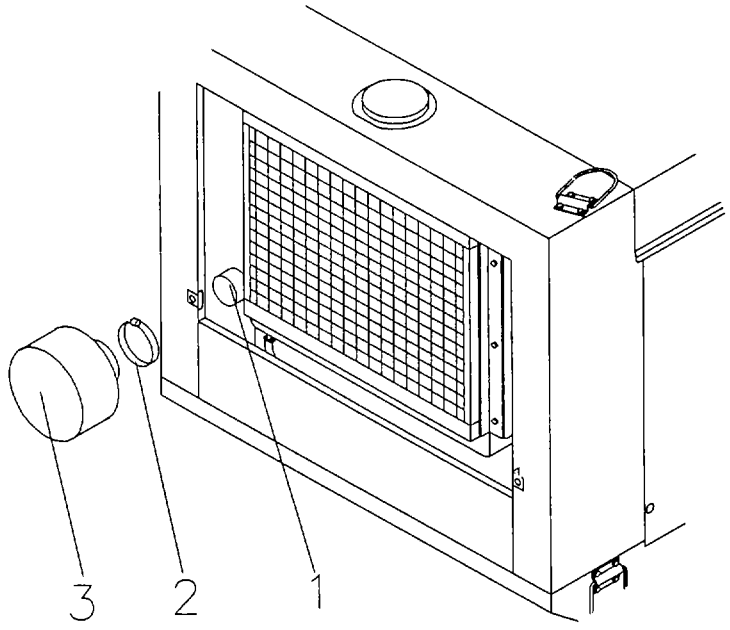


Figure 4-8. Air Filter.

4.19 BATTERY - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section m, Appendix B).

Equipment Condition:
Right side panel removed.

General Safety Requirements:

WARNING

Battery acid will cause burns to unprotected skin. Use caution when handling battery.

a. Removal. Refer to figure 4-9.

1) Disconnect the negative (6) cable from the battery (5).

2) Disconnect positive (1) cable from the battery (5).

3) Remove the two bolts (2) and locknuts (3) holding the battery clamp plate (7) to the battery cradle (4) Discard locknuts.

4) Remove battery clamp plate (7).

5) Lift the battery (5) out of its battery cradle (4).

b. Installation. Refer to figure 4-9.

1) Place the battery (5) in its battery cradle (4) with the positive connection towards the engine radiator.

2) Install the battery clamp plate (7) with the two bolts (2) and locknuts (3).

3) Connect the positive (1) battery cable.

4) Connect the negative battery cable (6).

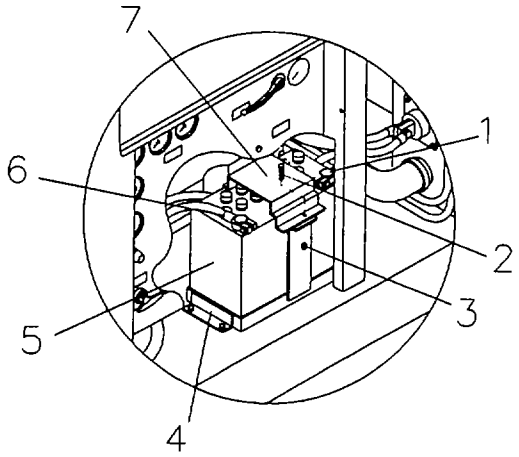


Figure 4-9.

4.20 ENGINE RADIATOR - SERVICE.

THIS TASK CONSISTS OF: a. Draining b. Flushing c. Refilling

INITIAL SETUP

Tools:
Toolkit, General Mechanics (Item 5, Section III, Appendix B)

General Safety Requirements

WARNING

Coolant/antifreeze is toxic. Avoid spilling of coolant/antifreeze, fuel or fluids. Clean up minor spills immediately. For large spills, notify your supervisor.

Equipment Condition:
All panels (5, 8, fig. 1-2) removed.
Engine stopped and cool.
Cabinet top cover removed. Refer to para 4 16.
Air filter removed. Refer to para 4 18.

Material/Parts Required:
Coolant/Antifreeze, item 1, Appendix E
Gasket, thermostat housing, item 1, Appendix 1.

a. Draining the engine radiator. Refer to figure 4-10.

1) Slide a suitable waste container under the hydraulic power supply at the drain valve (3).

2) Remove rain cap (5). Remove the radiator fill cap (1). Turn the drain valve (3) counterclockwise to drain the coolant/antifreeze. Close the drain valve (3) after draining by turning in valve clockwise.

3) Dispose of the waste coolant/antifreeze in accordance with local SOP.

b. Flushing the engine radiator. Refer to figure 4-13.

1) Remove screws (1) and washers (9).

2) Remove thermostat housing cover (2). Leave hose (7) connected to thermostat housing cover (2).

3) Remove thermostat housing gasket (3) and thermostat (4). Discard gasket.

4) Flush the engine through the thermostat housing (8) until clean water emerges from the housing cover (2).

5) Install thermostat (5), thermostat housing gasket (3) and thermostat housing cover (2). Install screws (1) and washers (9). Torque to 15.5 ft lb/21 Nm.

c. Filling the radiator. Refer to figure 4-10.

1) Refilling the radiator. A 40% solution of coolant/antifreeze must be used under all operating conditions. Use coolant/antifreeze (item 1, Appendix E). The capacity of the engine and radiator is 2 gallons/7.57 liters. A 40% solution may be made using 3.2 quarts/3.03 liters of coolant/antifreeze and adding water to make 2 gallonsn.57 liters.

2) Replace the radiator fill cap (1) and rain cap (5).

3) Install cabinet top cover. Refer to 4 16.

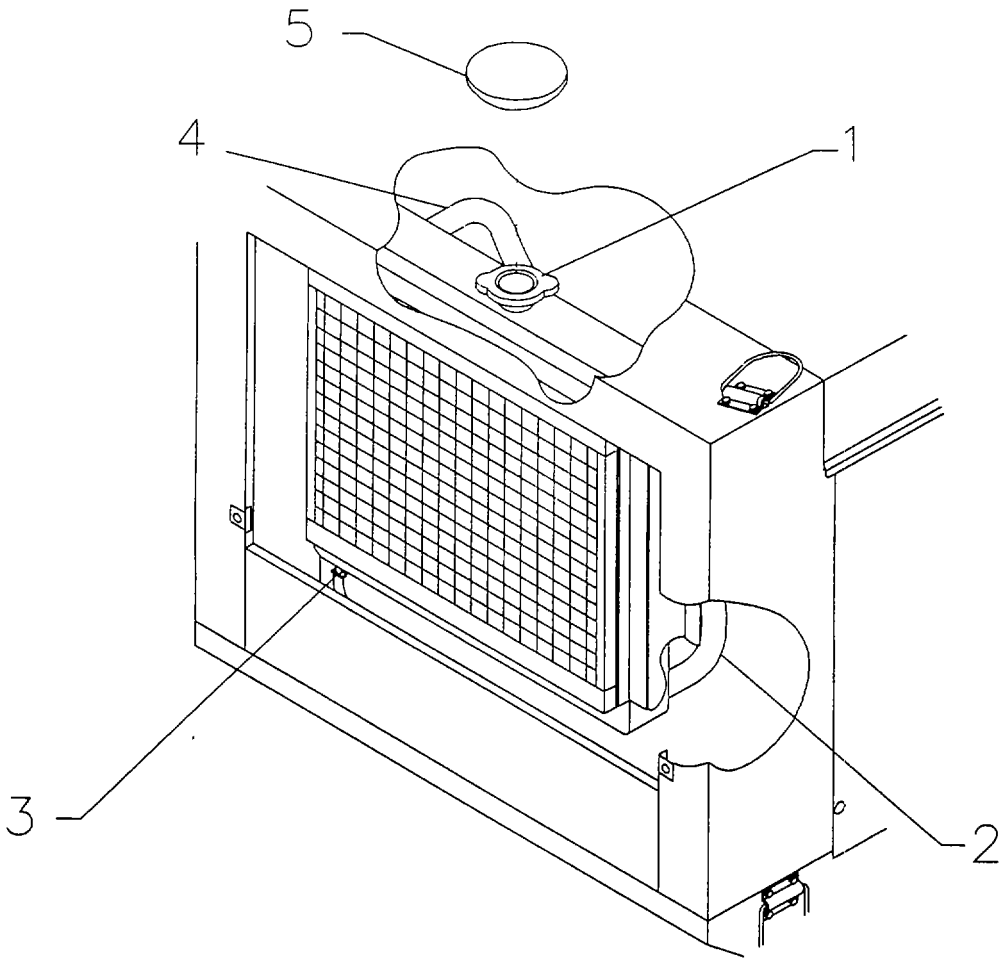


Figure 4-10. Engine Radiator.

4.21 FAN BELT - REPLACE, ADJUST.

THIS TASK CONSISTS OF: a. Removal b. Installation c. Adjustment

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair. Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B)

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. See paragraph 4.19.
Cabinet top cover removed. Refer to 4.16.

NOTE
The fan belt shall be replaced every 2000 hours regardless of its condition

a. Removal. Refer to figure 4-11.

1) Loosen the alternator adjusting bolts (3) and move the alternator (4) inward to slacken the belt tension.

2) Remove the fan belt (1).

b. Installation. Refer to figure 4-11.

NOTE
It is important that the tension of a new belt be checked after installation, after the first 25 hours and every 250 hours thereafter.

1) Install the new belt (1) in the pulley grooves and move the alternator (4) outward to apply tension to the belt. Tighten the alternator adjusting bolts (3) Apply tension only by hand, do not use any leverage.

2) Ensure all pulleys are aligned center of pulley grooves.

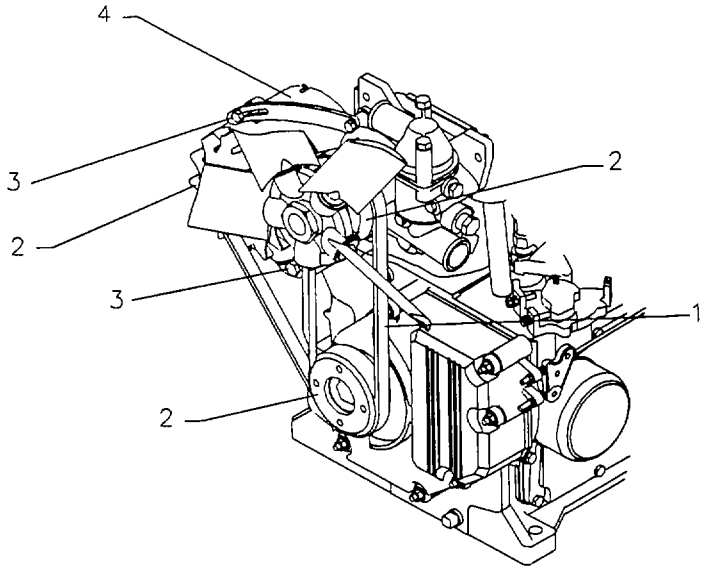


Figure 4-11. Fan Belt Replacement.

c. Adjustment. Refer to figure 4-12.

1) The belt tension is correct when belt is taut not tight using no leverage.

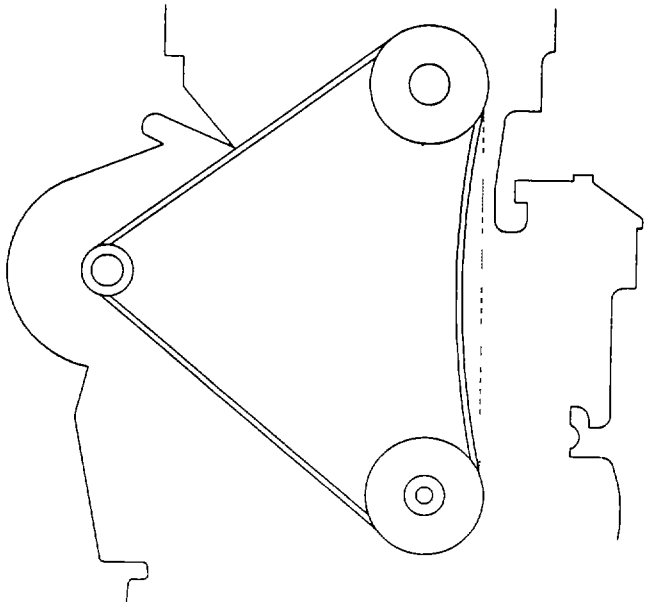


Figure 4-12. Fan Belt Adjustment.

4.22 THERMOSTAT - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).

Material/Parts Required:
Gasket, thermostat housing, item 1, Appendix I.

Equipment Condition:
Side panels (8, fig 1-2) removed.
Cabinet top cover removed. Refer to 4.16.
Battery disconnected. Refer to 4.19.

a. Removal. Refer to figure 4-13.

1) Remove the two cover retaining bolts (1), washers (9), cover (2), thermostat housing gasket (3) and thermostat (4). Discard thermostat housing gasket.

b. Installation. Refer to figure 4-13.

1) Replace the thermostat (4) into the housing (8) taking care to ensure the jiggle pin (5) moves freely and is located towards the radiator.

2) Replace the thermostat housing gasket (3), cover (2), cover retaining bolts (1), and washers (9).

3) Fill the system with clean fresh water and coolant/antifreeze concentrate to a 40% concentration. See paragraph 4.20.

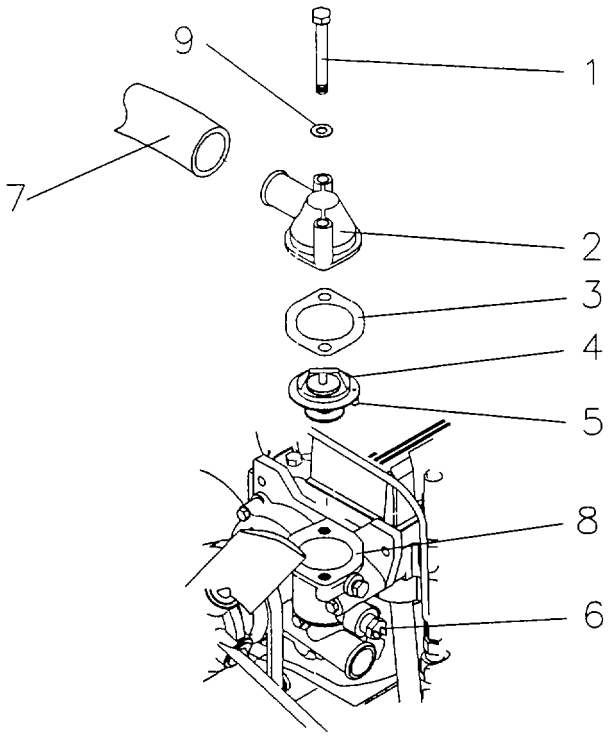


Figure 4-13. Thermostat.

4.23 FUEL FILTER - REPLACE.

THIS TASK COVERS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig 1-2) removed.
Battery disconnected. Refer to paragraph 4-19.

General Safety Requirements:

Material/Parts Required:
Fuel filter, item 14, Appendix E.

WARNING

Fuel is toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE.

a. Removal. Refer to figure 4-14.

1) Remove the center screw (2) of the filter assembly Discard the old element (1), in accordance with local SOP.

b. Installation. Refer to figure 4-14.

1) Install the new fuel filter (1), housing (3) and center bolt (2).

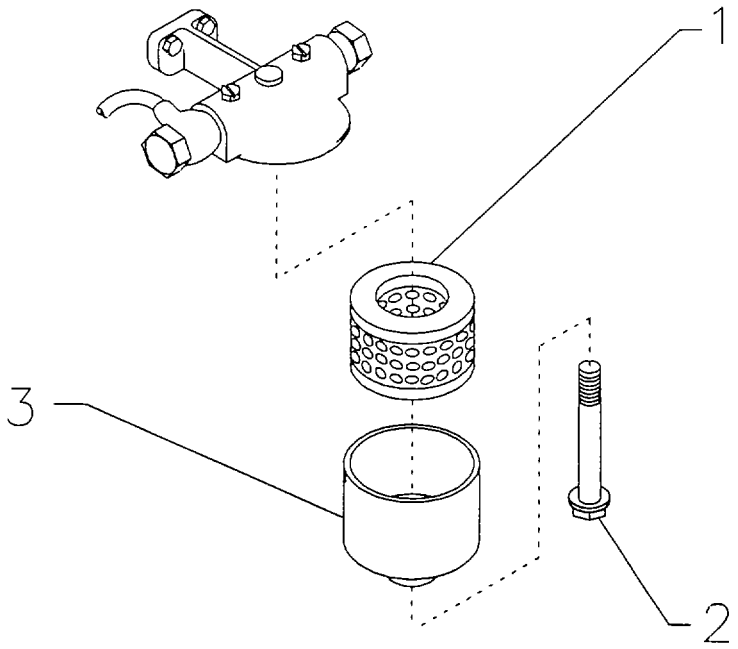


Figure 4-14. Fuel Filter.

4.24 FUEL CONTROL SOLENOID - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No 1, less power (item 6, Section m, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. See paragraph 4.19.

a. Removal. Refer to figure 4-15.

1) Tag wires (1), remove the two screws (2) and remove wires (1) from the fuel control solenoid (3).

2) Remove the cotter pin (9), washer (8) from the push/pull rod (7) and withdraw the push/pull rod (7) from the fuel control solenoid (3).

3) Remove the top bolt and nut (5) holding the fuel control solenoid (3) and the black solenoid ground wire (4) to the backplate (10).

4) Remove the bottom bolt and nut (6) and remove the fuel control solenoid (3) from the backplate (10).

b. Installation. Refer to figure 4-15.

1) Install the fuel control solenoid (3) and secure to backplate (10) with bottom bolt and nut (6).

2) Install black solenoid ground wire (4) and secure to backplate (10) with top bolt and nut (5). Torque top bolt (5) to 5 ft. lb. (7 0 Nm).

3) Install push/pull rod (7), washers (8) on to fuel control solenoid (3) and secure with cotter pin (9).

4) Install wires (1) on to fuel control solenoid (3) and secure with screws (2).

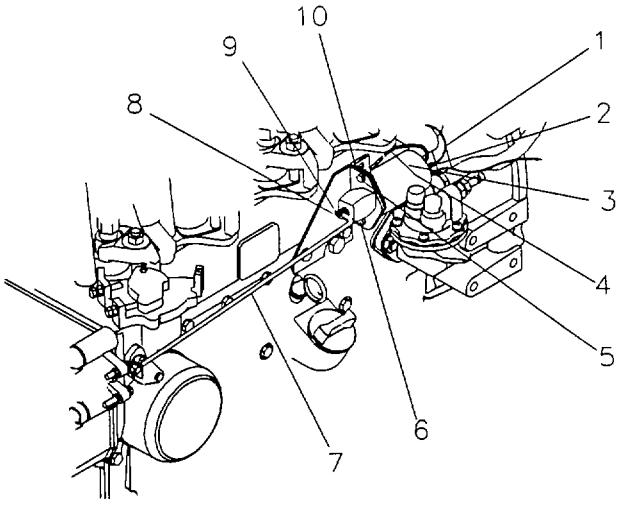


Figure 4-15. Fuel Control Solenoid.

4.25 ALTERNATOR - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B)
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer paragraph 4.19.
Cabinet top cover removed. Refer to paragraph 4.16.

a. Removal. Refer to figure 4-16.

1) Tag and remove the three wires (6) from the alternator (11).

2) Remove and retain the adjusting link screw (1) flatwasher (2) lockwasher (3) Discard lockwasher.

3) Remove fan belt (13) from the alternator (11).

4) Support the alternator (11) and remove bottom nut (9) lockwasher (10) flatwasher (5) and bolt (4). Discard lockwasher.

5) Remove alternator (11).

b. Installation. Refer to figure 4-16.

1) Support the alternator (11) in position and install the bottom bolt (4) flatwasher (5) lockwasher (10) and nut (9). Hand tighten only.

2) Install the fan belt (13) in position and install the adjusting link screw (1), lockwasher (2) and flatwasher (3) to the slotted support arm (12). Hand tighten.

3) Move the alternator (11) outward by hand to apply the proper belt tension, making sure that the belt is properly positioned on the crankshaft and radiator fan pulleys. Refer to paragraph 4.21.

4) Install the alternator wires (6). Secure with lockwashers (7) and nut (8).

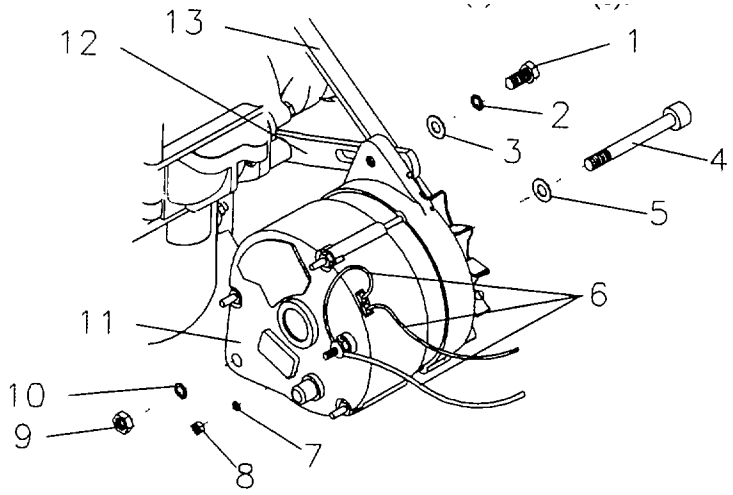


Figure 4-16. Alternator.

4.26 STARTER - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section m, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Cabinet top cover removed. Refer to paragraph 4.16.

a. Removal. Refer to figure 4-17.

1) Remove nuts (14) and lockwashers (13). Discard lockwashers.

2) Remove screw (5) and lockwasher (6). Tag and remove starter switch wire (4) from starter solenoid (8).

3) Tag and remove fuel solenoid wire (12) from starter solenoid (8).

4) Tag and remove positive battery cable (3) slave receptacle cable (1) and harness wire (2) from starter solenoid (8).

5) Support starter (11) and remove screws (9) and flatwashers (10) Remove starter (11).

b. Installation. Refer to figure 4-17.

1) Install the starter (11) using flatwashers (10) mounting bolts (9) and secure to 30 0 ft. lb. (41.0 Nm).

2) Install the wires (1), (2), and (3) and (12) to the starter solenoid. Install lockwashers (13) and nuts (14) to the starter solenoid and secure to 4.5/8.5 ft lb (5.89/11 77 Nm).

3) Install wire (4) lockwasher (6) and screw (5) to the starter solenoid (8).

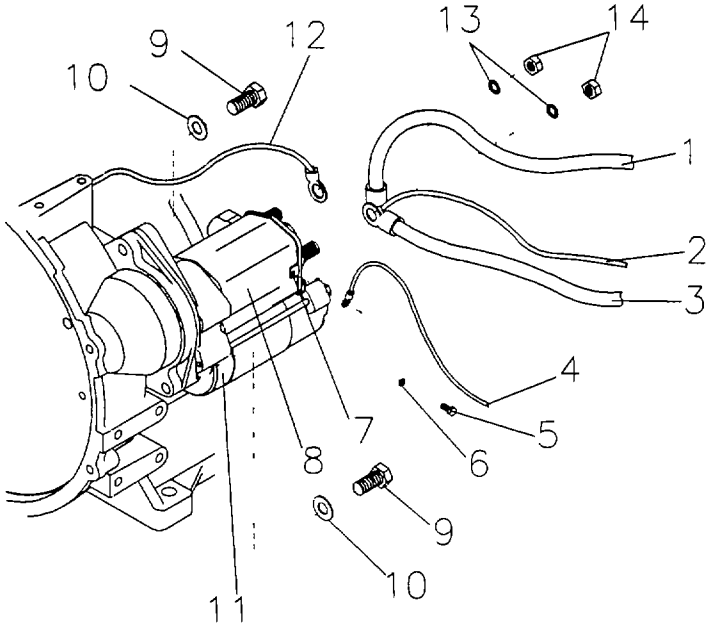


Figure 4-17. Starter.

4.27 GLOW PLUGS - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B)

Equipment Condition:
Right side panel (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Cabinet top cover removed. Refer to paragraph 4.16.

a. Removal. Refer to figure 4-18.

1) Remove nuts (5) and lockwashers (4). Discard lockwashers.

2) Tag and remove the red connecting wire (3) from the glow plug (1).

3) Tag and remove the interconnecting wire (2) from the two glow plugs (1).

4) Remove the two glow plugs (1).

b. Installation. Refer to figure 4-18.

1) Install the two glow plugs (1) in the intake manifold and torque to 20.0 ft. lb. (27.0 Nm).

2) Install interconnecting wire (2) and connecting wire (3) to the glow plugs (1) and secure with lockwasher (4) and nut (5).

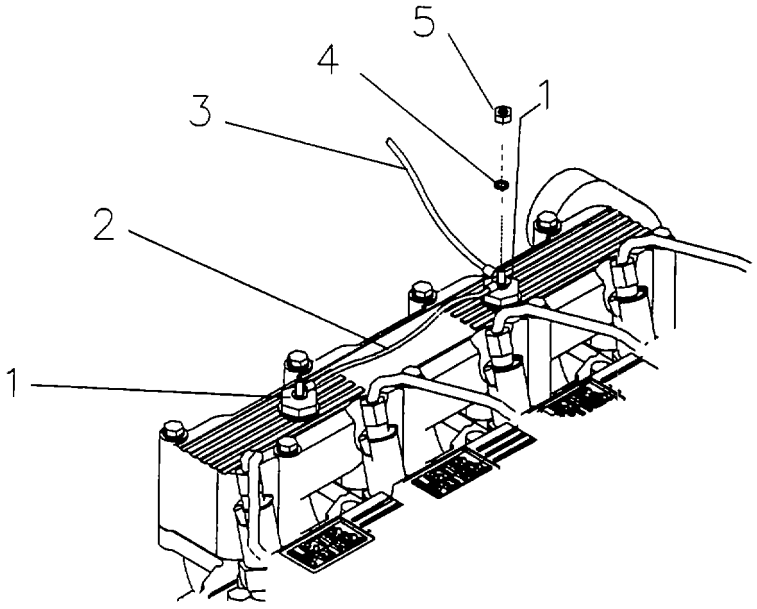


Figure 4-8. Glow Plugs.

SECTION VII. PREPARATION FOR STORAGE AND SHIPMENT

4.28 PREPARATION FOR STORAGE AND SHIPMENT.

a. Drain fuel and hydraulic fluid tanks. Refer to paragraphs 4.17 and 4.3 respectively.

b. Remove battery from the hydraulic power supply Refer to paragraph 4.19.

c. Install the engine retainers (3, 9, fig. 4-4) to the engine.

d. Install the two side panels (8, fig 1-2) and the front panel (5, fig 1-2).

4.29 SPECIAL INSTRUCTIONS FOR ADMINISTRATIVE STORAGE.

4.29.1 Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

4 29.2 Before placing the equipment in administrative storage, current preventive maintenance checks and services should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

4.29.3 Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers, and other containers may be used.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Page

SECTION I DIRECT SUPPORT TROUBLESHOOTING 5-1

5.1 Troubleshooting Chart 5-1
5.2 Malfunction Index 5-1

SECTION II DIRECT SUPPORT MAINTENANCE PROCEDURES 5-4

5.3 Introduction 5-4
5.4 Panel Mounted Instruments 5-4
5.5 Hydraulic Fluid Tank 5-6
5.6 Oil Cooler 5-8
5.7 Hydraulic Valve Assembly 5-9
5.8 Hydraulic Control Manifold 5-10
5.9 Hydraulic Relief Valves 5-11
5.10 Fuel Tank 5-12
5.11 Engine Radiator 5-14
5.12 Radiator Fan 5-16
5.13 Water Pump 5-17
5.14 Engine Speed Setting 5-19
5.15 Fuel Injector 5-20

SECTION I. DIRECT SUPPORT TROUBLESHOOTING

5.1 TROUBLESHOOTING CHART

5.1.1 Table 5-1 lists common malfunctions that you may find with the power supply. Perform the tests, inspections and corrective actions In the order they appear In the table.

5.1 2 This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

5.2 MALFUNCTION INDEX.

For quick access to troubleshooting procedures refer to Table 5-1, Malfunction Index.

TABLE 5-1. MALFUNCTION INDEX

	MALFUNCTION	PAGE
1	Fails to Deliver Full Power	5-2
2	Stops Suddenly Under Load	5-3

TABLE 5-2. DIRECT SUPPORT TROUBLESHOOTING.

MALFUNCTION 1. FAILS TO DELIVER FULL POWER

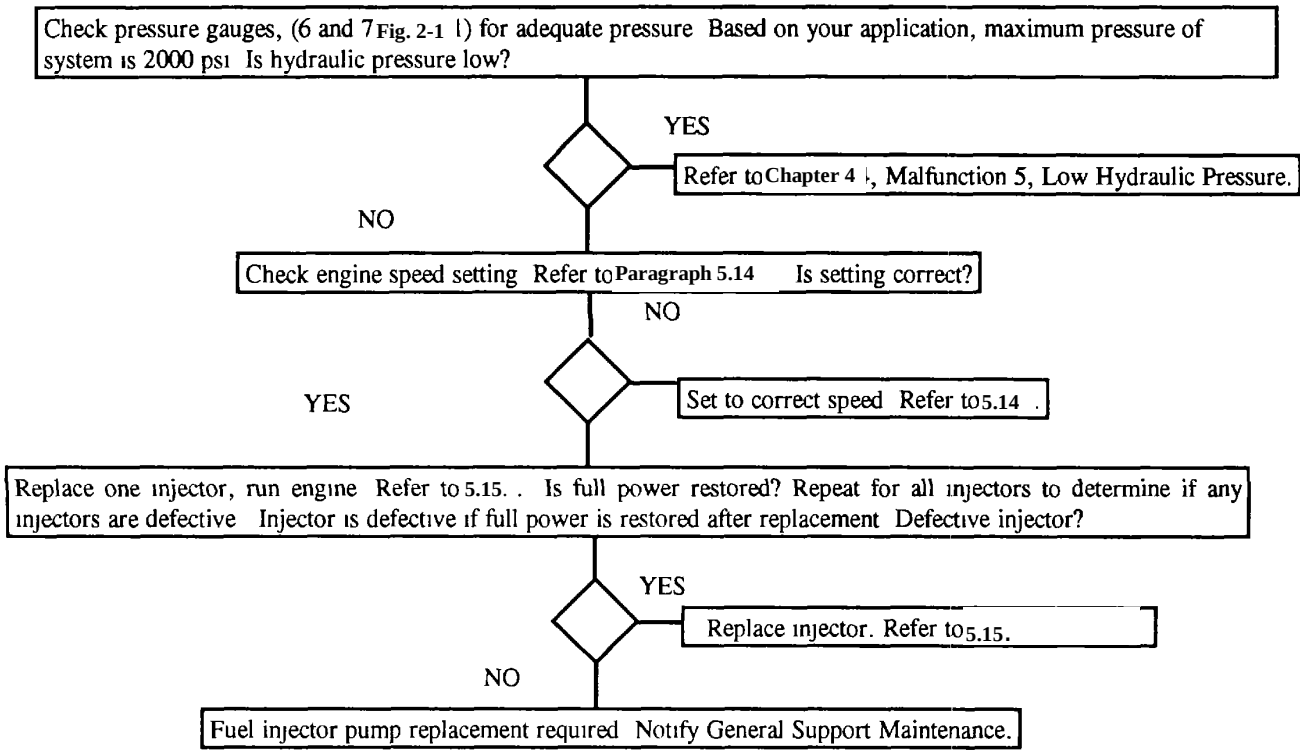
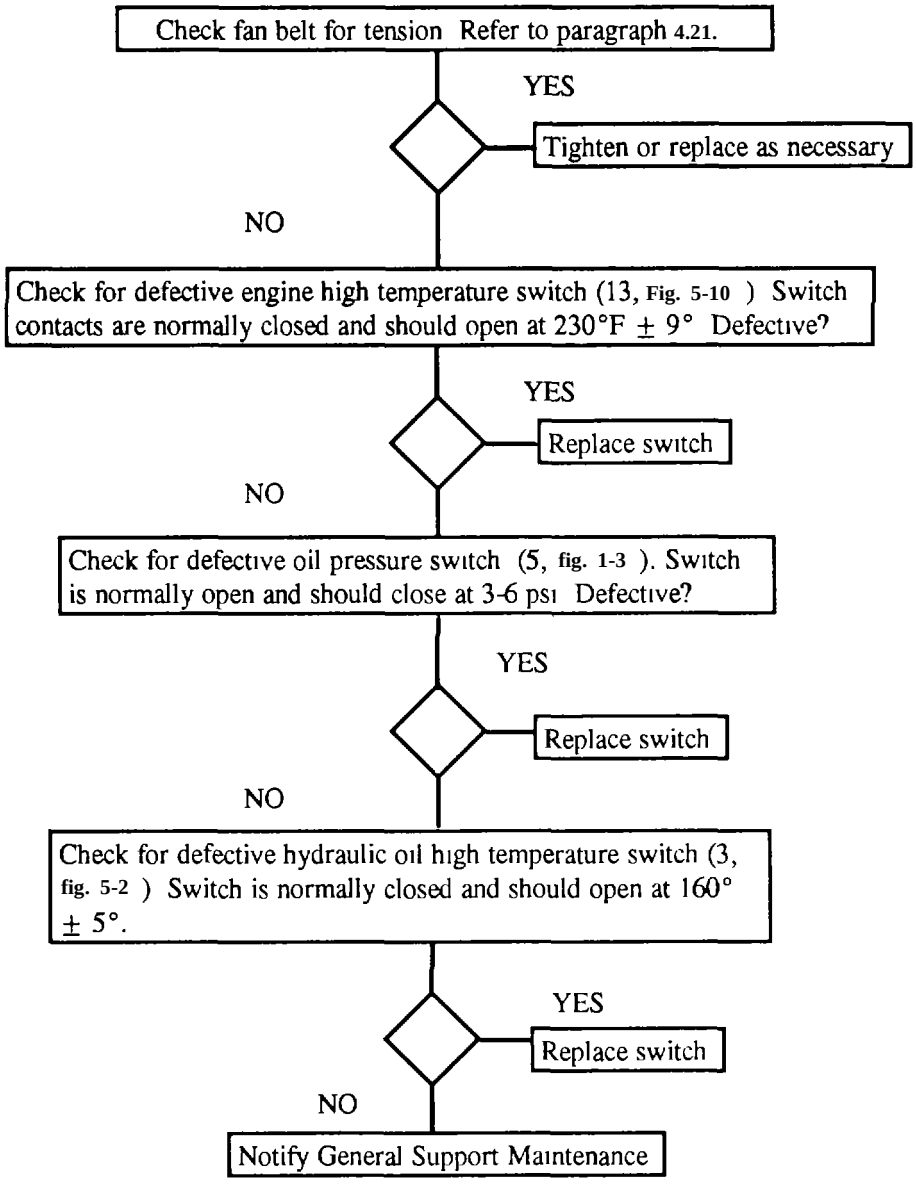

Check pressure gauges, (6 and 7 Fig. 2-1 1) for adequate pressure Based on your application, maximum pressure of system is 2000 psi Is hydraulic pressure low?
YES
Refer to Chapter 4 4, Malfunction 5, Low Hydraulic Pressure.
NO
Check engine speed setting Refer to Paragraph 5.14 Is setting correct?
NO
YES
Set to correct speed Refer to 5.14 .
Replace one injector, run engine Refer to 5.15. . Is full power restored? Repeat for all injectors to determine if any injectors are defective Injector is defective if full power is restored after replacement Defective injector?
YES
Replace injector. Refer to 5.15.
NO
Fuel injector pump replacement required Notify General Support Maintenance.

TABLE 5-2. DIRECT SUPPORT TROUBLESHOOTING. (CONTINUED).

MALFUNCTION 2. STOPS SUDDENLY UNDER LOAD


Check fan belt for tension Refer to paragraph 4.21.
YES
Tighten or replace as necessary
NO
Check for defective engine high temperature switch (13, Fig. 5-10) Switch contacts are normally closed and should open at 230°F ± 9° Defective?
YES
Replace switch
NO
Check for defective oil pressure switch (5, fig. 1-3). Switch is normally open and should close at 3-6 psi Defective?
YES
Replace switch
NO
Check for defective hydraulic oil high temperature switch (3, fig. 5-2) Switch is normally closed and should open at 160° ± 5°.
YES
Replace switch
NO
Notify General Support Maintenance

SECTION II. DIRECT SUPPORT MAINTENANCE PROCEDURES

5.3 INTRODUCTION.

5 3.1 This section details those maintenance procedures which would be carried out at a Direct Support level.

5.4 PANEL MOUNTED INSTRUMENTS - REPLACE.

NOTE

The following procedure is common to items 1, 2, 3, 15 and 16, figure 2-1

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B)
Shop Equipment Automotive Maintenance and Repair Organizational Maintenance, Common No. 1, less power (item 6, Section m, Appendix B)

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected Refer to paragraph 4.19
Cabinet top cover removed. Refer to paragraph 4.16.

NOTE

All of the panel controls, with the exception of the start switch, are retained by panel nuts and retainer behind the control panel and are removed from the front of the control panel. The start switch panel nut is on the front of the panel and the switch is removed from the rear.

a. Removal. Refer to figure 5-1.

1) Remove the nuts (6), lockwashers (7), flatwashers (8), tag and remove wires (9) and resistor assembly (10), where applicable, connected to the instrument (1) to be removed. Discard lockwashers.

2) Remove the nuts (5), lockwashers (4), flatwasher (3), and retainer (2). Discard lockwashers.

3) Remove the instrument (1) from the front of the panel.

b. Installation. Refer to figure 5-1.

NOTE

Ensure controls are Installed in their original position.

1) Install the instrument (1) through the front of the panel.

2) Place the retainer (2) over the terminal studs (11) and install flatwashers (3), lockwashers (4), and nuts (5).

3) Install the resistor assembly (10), where applicable, wires (9), flatwashers (8), lockwashers (7) and nuts (6).

4) Connect the battery. Refer to paragraph 4.19.

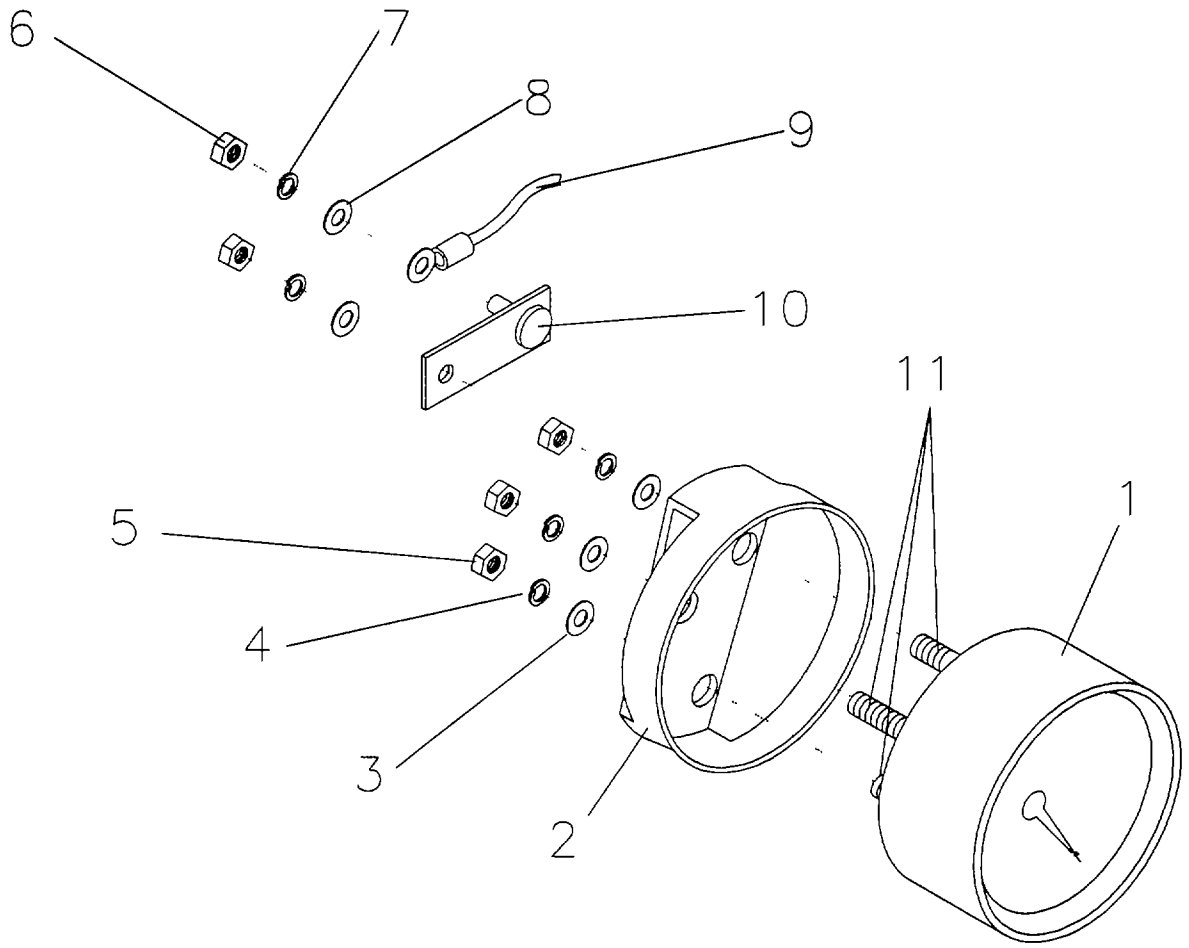


Figure 5-1. Pane Mounted Instruments.

5.5 HYDRAULIC FLUID TANK - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section II, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section m, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Hydraulic fluid drained. Refer to 4.3.
Battery disconnected. Refer to 4.19
Fuel tank removed. Refer to 4.17.
Cabinet top cover removed. Refer to 4.16.

General Safety Requirements:

WARNING

Hydraulic fluids are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE.

Material/Parts Required:
Hydraulic fluid, item 7 or 8, Appendix E.

a. Removal. Refer to figure 5-2.

1) Tag and remove the wires (2) from oil overtemp switch (3).

2) Remove and plug hose (4) from hydraulic fluid tank (11).

3) Remove hydraulic fluid tank drain valve (10).

CAUTION

Ensure hydraulic fluid filter and housing are not damaged when removing hydraulic fluid tank from unit.

4) Remove the hydraulic fluid tank assembly from rear of the cabinet.

b. Installation. Refer to figure 5-2.

1) Install the hydraulic fluid tank (11) through the rear of the cabinet, making sure the bottom mounting angle (7) is to the front.

2) Install the fuel tank (15). Refer to paragraph 4.17.

3) Connect the fluid lines (1) at the return filter housing (16) on the hydraulic fluid tank (11).

4) Connect the hose (4) to the hydraulic fluid tank (11).

5) Connect the wires (2) to the oil overtemp switch (3).

6) Install the hydraulic fluid tank drain valve (10).

7) Install nuts (9), lockwashers (8), flatwashers, (6), bolts (5), flatwashers (14), lockwashers (13) and screws (12). Refer to 4.17.

8) Fill hydraulic fluid tank with hydraulic fluid. Refer to paragraph 4.3.

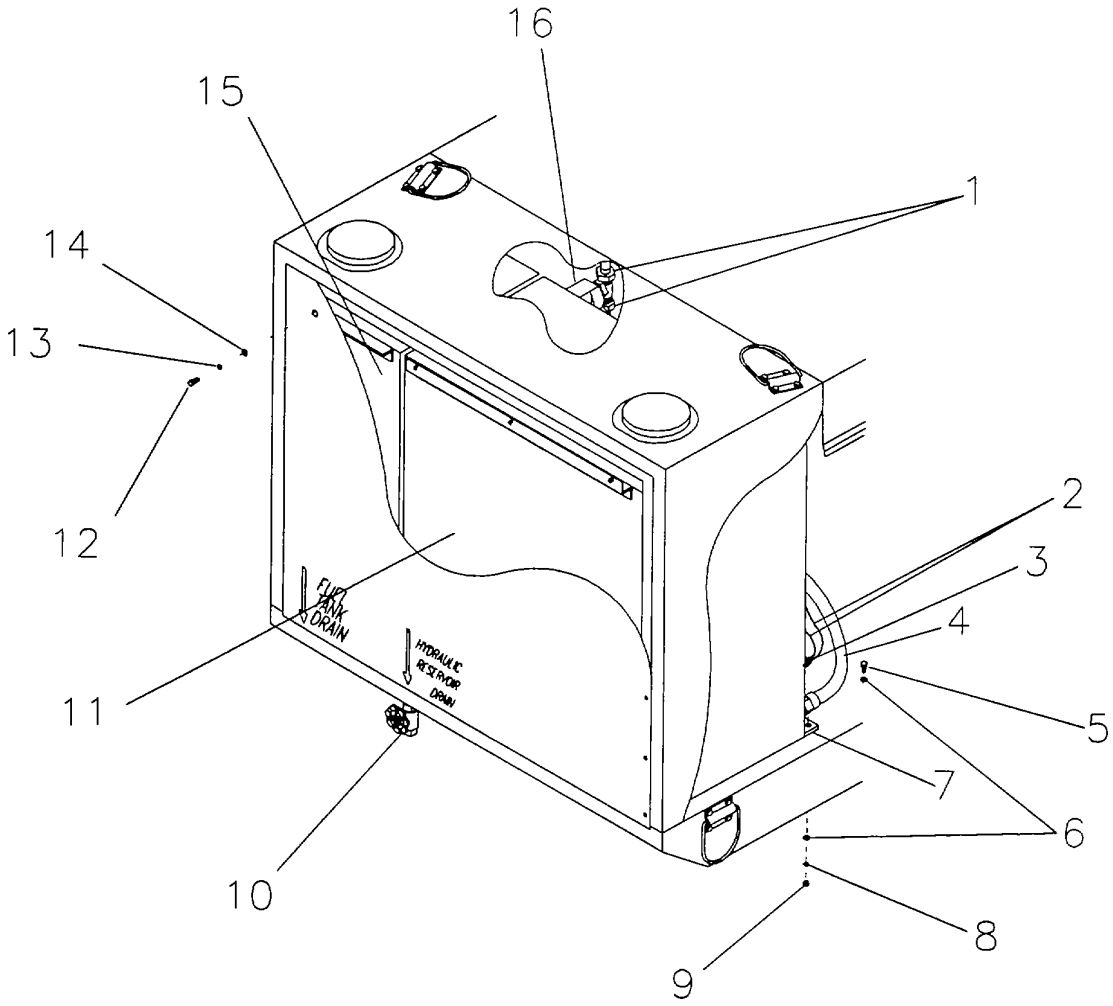


Figure 5-2. Hydraulic Fluid Tank.

5.6 OIL COOLER - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Front and side panels removed (5 and 8, fig 1-2).
Cabinet top cover removed. Refer to paragraph 4.16.
Hydraulic fluid tank drained. Refer to paragraph 4.3.

General Safety Requirements:
Hydraulic fluid, item 7 or 8, Appendix E.

Materials/Parts Required

WARNING

Hydraulic oils are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE.

a. Removal. Refer to figure 5-3.

1) Disconnect and plug the two hydraulic lines (1) from the oil cooler (5).

2) Remove the screws (4), lockwashers (3) and flatwashers (2) on each side of the oil cooler and remove oil cooler from cabinet.

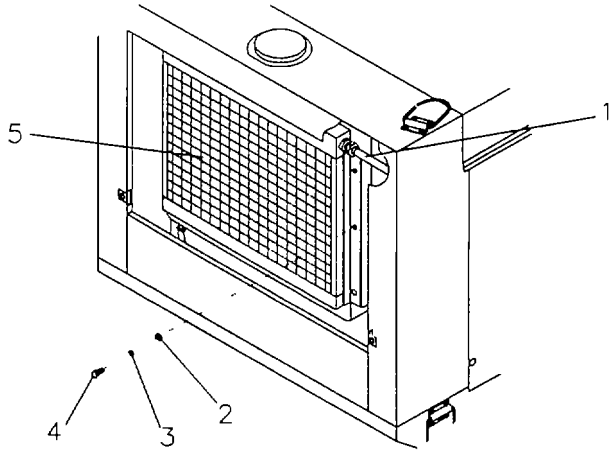


Figure 5-3. Oil Cooler.

b. Installation. Refer to figure 5-3.

1) Install oil cooler (5) to radiator with the screws (4), lockwashers (3) and flatwashers (2). Hand tighten screws at this time.

2) Connect hydraulic lines (1) to oil cooler (5).

3) Tighten screws (4).

4) Fill the hydraulic fluid tank. Refer to paragraph 4.3.

5.7 HYDRAULIC VALVE ASSEMBLY - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Tool kit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair:
Organizational Maintenance, Common No. 1,
less power, (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Cabinet top cover removed. Refer to paragraph 4.16
Drain hydraulic fluid tank. Refer to paragraph 4.3.

a. Removal, Refer to figure 5-4

1) Disconnect and plug the four fluid lines (5) attached to the hydraulic valve assembly (7).

NOTE

Make note of the relative position of the index marks on the valve stems and on the valve handles The two smaller valves have the marks aligned and the larger valve has the handle displaced 45 degrees counterclockwise. The index marks on the valve bodies indicate through flow when they are aligned longitudinally with the valve body

2) Remove the center screws (3) and flat washers (4) In the valve handles (6) and remove the three valve handles (6).

3) Supporting the hydraulic valve assembly (7) from underneath, remove the two screws (2) and lockwashers (1) holding the hydraulic valve assembly (7) to the panel and withdraw the hydraulic valve assembly from above.

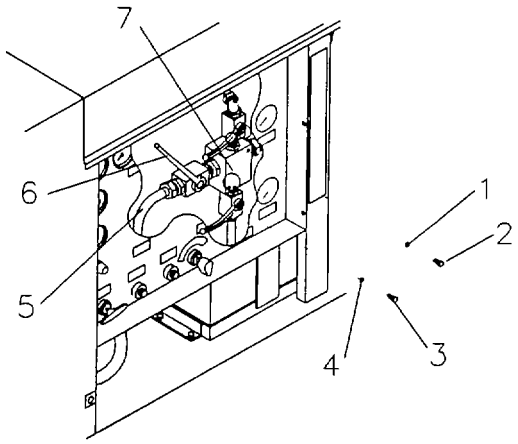


Figure 54. Hydraulic Valve Assembly.

b. Installation. Refer to figure 5-4.

1) Install the hydraulic valve assembly (7) on the panel and secure with lockwashers (1) and screws (2).

2) Install the valve handles (6) in their original positions and secure with washers (4) and screws (3)

3) Connect the fluid lines (5) and tighten connections

4) Install top cover. Refer to paragraph 4 16 Fill the hydraulic fluid tank Refer to paragraph 4.3.

5.8 HYDRAULIC CONTROL MANIFOLD - REPLACE.

THIS TASK CONSISTS OF: a. Removal b Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Hydraulic fluid tank drained. Refer to para. 4.3

a. Removal. Refer to figure 5-5.

1) Disconnect the seven hydraulic lines (1) and two hoses (7) from the hydraulic control manifold (2).

2) Remove and retain relief valves (3)

3) Remove the screws (5) and lockwashers (6) holding hydraulic control manifold (2) to mounting bracket (4).

4) Remove hydraulic control manifold (2) from mounting bracket (4).

b Installation, Refer to figure 5-5

1) Attach hydraulic control manifold (2) to its mounting bracket (4) and secure with screws (5) and lockwashers (6). Torque to 4.0 ft. lb.(5.6 Nm).

2) Install relief valves (3)

3) Connect the seven hydraulic lines (1) and the two hoses (7) to hydraulic control manifold (2).

4) Fill the hydraulic fluid tank Refer to paragraph 4 3

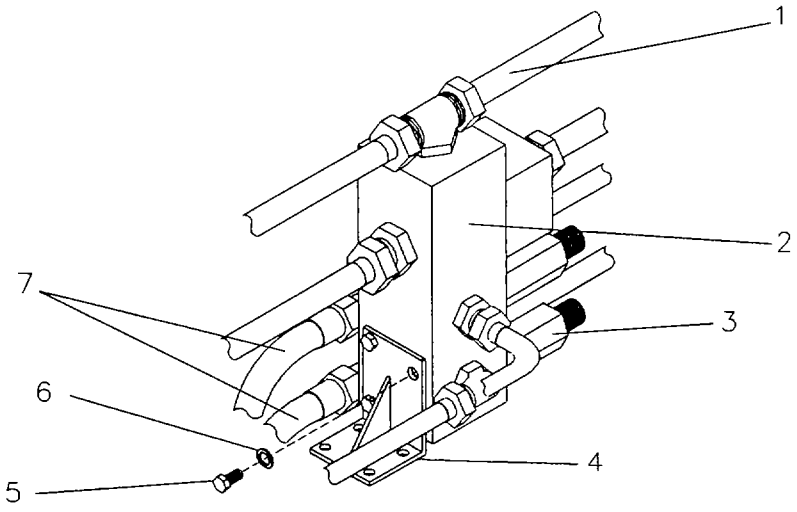


Figure 5-5. Hydraulic Control Manifold.

5.9 HYDRAULIC RELIEF VALVES - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B)
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.

General Safety Requirements:

WARNING

Do not use near heat or open flame.
Hydraulic oils are toxic and flammable.
Area should be well ventilated DO NOT SMOKE.

Material/Parts Required
Preformed Packing, Hydraulic (O-rings), items 1 and 2, Appendix I.
Hydraulic fluid, item 7 or 8, Appendix E.

a. Removal. Refer to figure 5-6

NOTE

The hydraulic control manifold need not be removed In order to remove or install the hydraulic relief valves

1) Remove hydraulic relief valve body (1) from the hydraulic control manifold (4).

2) Remove preformed packings (2, 3) and discard.

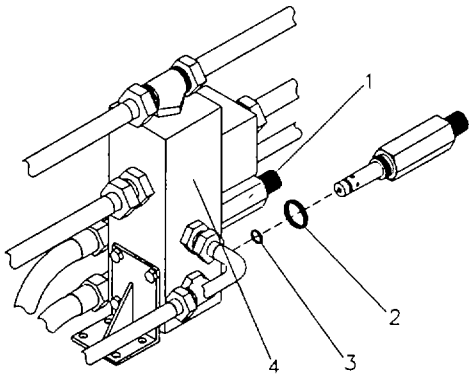


Figure 5-6. Hydraulic Relief Valves.

b. Installation, Refer to figure 56.

1) Install preformed packings, hydraulic (O-rings) (2 and 3), to relief valve Apply a coating of hydraulic fluid to the valve stem and threads.

2) Insert the valve (1) in the hydraulic control manifold (4) and torque to 12.0 ft. lb. (16.27 Nm).

3) Fill the hydraulic fluid tank Refer to paragraph 4.3.

5.10 FUEL TANK- REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

General Safety Requirements:

WARNING

Hydraulic oils are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE.

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Fuel tank drained Refer to paragraph 4.17.
Cabinet top cover removed. Refer to para. 4.16.
Hydraulic fluid tank drained. Refer to para. 4 3

Material/Parts Required:
Fuel, item 5 or 6, Appendix E.
Caulk, latex, item 12, Appendix E.

a. Removal, Refer to figure 5-7.

1) Remove the rear panel (12). Remove screws (11), flatwashers (10), lockwashers (9) and screws (8) and remove panel (12). Discard lockwashers

2) Tag and remove the two wires (16) going to the fuel gauge sender (15) on top of the fuel tank (13).

3) Remove and plug hoses (1 and 4) at the fuel tank (13).

4) Disconnect and plug two hydraulic lines (1, fig. 5-2).

5) Remove the nuts (9, fig. 5-2), lockwashers (8, fig. 5-2), flatwashers (6, fig. 5-2) and bolts (5, fig. 5-2) securing hydraulic fluid tank to the cabinet floor Discard lockwashers.

6) Push hydraulic fluid tank (11, fig. 5-2) to the side and remove fuel tank (13) from the rear of the cabinet.

b. Installation. Refer to figure 5-7

1) Install the fuel tank (13) through rear of the cabinet, with the bottom mounting angle (17) to the front

2) Secure both fuel tank (13) and hydraulic fluid tank (11, fig. 5-2) to the cabinet floor with bolts (5, fig. 5-2), flatwashers (6, fig. 5-2), lockwashers (8, fig. 5-2) and nuts (7, fig. 5-2) Hand tighten at this time.

3) Install the rear panel (12) and secure with screws (11).

4) Secure both tanks with flatwashers (10), lockwashers (9) and screws (8) Tighten bolts (2), lockwashers (6) and nuts (5).

5) Install wires (16) to the fuel sender (15) on the fuel tank (13).

6) Connect fuel hoses (1 and 4) to the fuel tank (13).

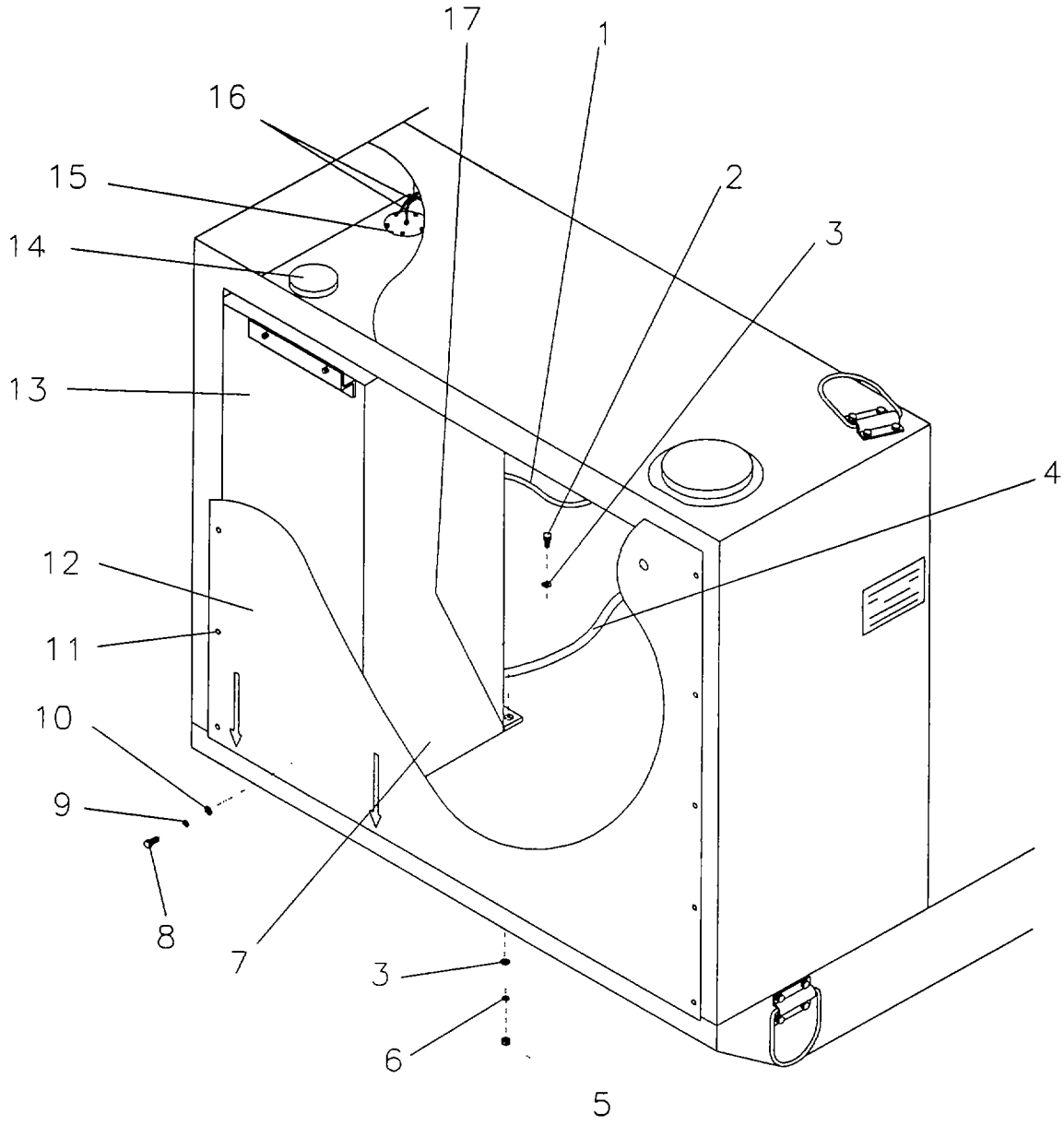


Figure 5-7. Fuel Tank

5.11 ENGINE RADIATOR - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section Im, Appendix B)
Shop Equipment, Automotive Maintenance and Repair
Organizational Maintenance, Common No 1, less
power (item 6, Section III, Appendix B).
Oil cooler removed. Refer to paragraph 5.6.

Equipment Condition:
Front and side panels (5,8, fig. 1-2) removed
Battery disconnected. Refer to paragraph 4.19
Hydraulic fluid tank drained Refer to paragraph 4.3.
Coolant/antifreeze drained. Refer to paragraph 4.20.

General Safety Requirements:

WARNING

Hydraulic oils are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE
Coolant may be hot If unit was recently running
Be sure to let unit cool before performing the following procedures

Material/Parts Required
Coolant/antifreeze, item 1, Appendix E
Hydraulic fluid, item 7 or 8, Appendix E.

a. Removal. Refer to figure 5-8

1) Remove the nine screws (11) retaining the upper and lower panels (10)

2) Disconnect the upper (1) and lower (9) radiator hoses at the radiator (12).

3) Remove the nuts (8), lockwashers (7), flatwashers (6) and screws (5) on each side of the engine radiator and remove the engine radiator (12).

b. Installation. Refer to figure 5-8.

1) The engine radiator (12) has two slotted and one tight fitting bolt holes on each side Install the screws (5), lockwashers (7), flatwashers (6) and nuts (8) In the tight fitting holes first These provide the proper alignment for the fan and the radiator shroud. Install the remaining bolts (5), lockwashers (7), flatwashers (6), and nuts (8) and tighten.

2) Connect the upper (1) and lower (9) radiator hoses to the radiator.

3) Install upper and lower panels (10) with nine screws (11).

4) Fill the hydraulic fluid tank. Refer to paragraph 4.3.

5) Fill the engine radiator (12) with coolant/antifreeze. Refer to paragraph 4.20.

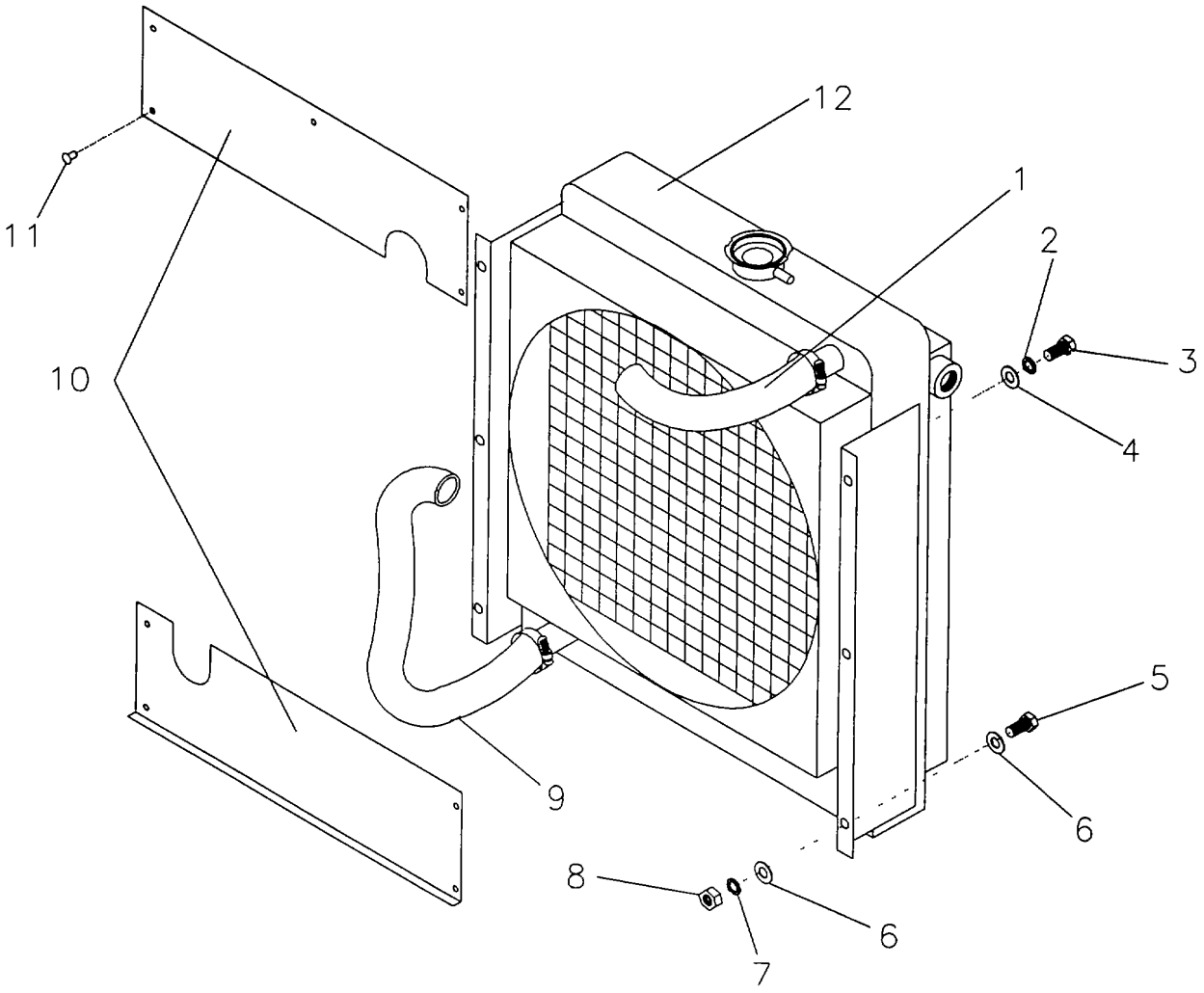


Figure 5-8. Engine Radiator.

5.12 RADIATOR FAN - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Battery disconnected. Refer to paragraph 4.19.
Side panels (8, fig. 1-2) removed.
Radiator/Cooler assembly removed. Refer to paragraph 5.11

a. Removal, Refer to figure 5-9.

CAUTION
THE RADIATOR FAN IS RETAINED BY A LEFT HAND THREAD RETAINING NUT

1) Remove the fan retaining nut (2) by turning clockwise.

2) Remove the fan (3).

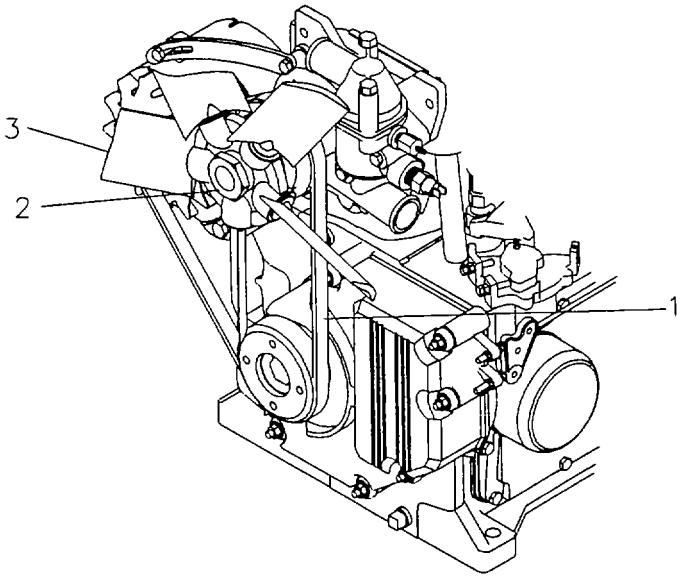


Figure 5-9. Radiator Fan.

b. Installation. Refer to figure 5-9.

1) Install the fan (3) and secure with nut (2) by turning counterclockwise. Torque nut (2) to 22 ft. lb./30 Nm.

2) Check fan belt (1) tension. Refer to paragraph 4.21

5.13 WATER PUMP- REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair' Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

General Safety Requirements:

WARNING

Solvents are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated. DO NOT SMOKE
Coolant may be hot if unit was recently running
Be sure to let unit cool before performing the following procedures

Equipment Condition:
Side and front panels(5,8, fig. 1-2) removed
Battery disconnected. Refer to paragraph 4 19.
Engine radiator removed. Refer to paragraph 5.11.
Fan belt removed. Refer to paragraph 4.21
Cabinet top cover removed. Refer to paragraph 4.16.

Material/Parts Required
Gasket, item 6, Appendix I.
Gasket, item 15, Appendix I.
Coolant/antifreeze, item 1, Appendix E.
Packings, preformed, item 14, Appendix I

a Removal. Refer to figure 5-10

1) Remove screws (22), flatwashers (21), thermostat housing cover (1), thermostat gasket (2) and thermostat (3) Refer to paragraph 4.22

2) Remove nut (11), lockwasher (10) and flatwasher (9).

3) Tag and remove wires (8) and (12).

4) Remove engine temperature sending unit (7) and engine high temperature cutoff switch (13).

5) Remove five screws (16), two stud nuts (14) and flatwashers (15,17) from water pump (18) Remove water pump (18), gasket (19), mounting plate (20) and gasket (4).

6) Remove sleeve (6) and packings, preformed (5) Discard packings, preformed. Retain sleeve.

NOTE

Clean debris from crankcase face, both sides of mounting plate and face of water pump prior to installation.

b. Installation. Refer to figure 5-10.

1) Install packings, preformed (5), and sleeve (6) into back of water pump (18)

2) Install gasket (4), mounting plate (20), gasket (19), water pump (18), flatwashers (17), and screws (16). Torque to 15.5 ft. lb /20 Nm.

3) Install stud nuts (14) and flatwashers (15) and torque to 12 ft. lb./16 Nm

4) Install engine high temperature cutoff switch (13) and engine temperature sending unit (7).

5) Install wires (8) and (12)

6) Install flatwasher (9), lockwasher (10) and nut (11)

7) Install thermostat (3), thermostat gasket (2) and thermostat housing cover (1), flatwasher (21) and screws (22). Refer to paragraph 4.22.

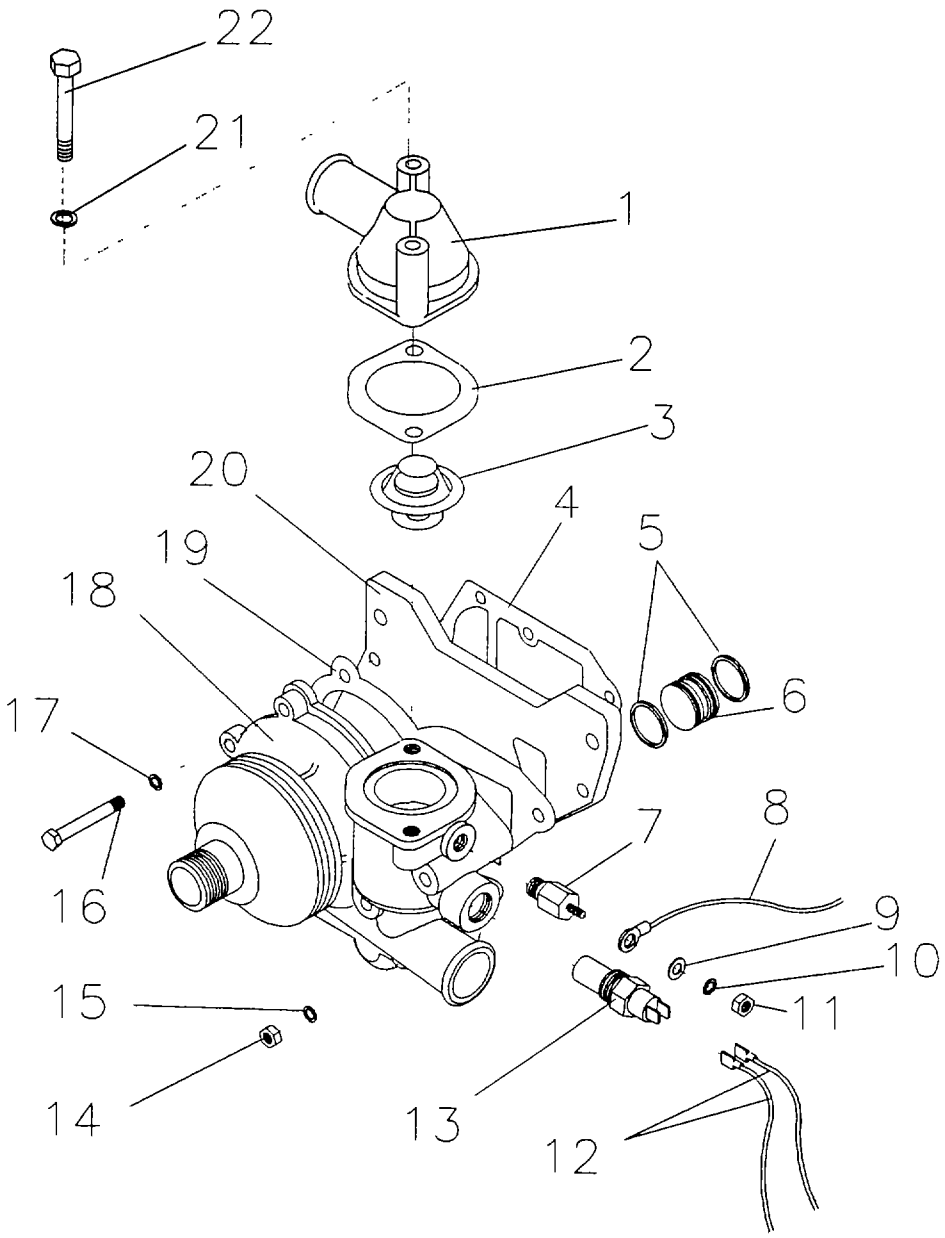


Figure 5-10. Water Pump Assembly.

5.14 ENGINE SPEED SETTING - ADJUST.

THIS TASK CONSISTS OF: a. Setting the idle speed b. Setting the running speed

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.

General Safety Requirements:

WARNING

Stay clear of all rotating, moving, or hot components.
DANGER- Carbon Monoxide can kill. Operate In a well ventilated area Avoid breathing exhaust gases.

a Setting idle speed. Refer to figure 5-11.

1) Using tachometer (part of item 6, Appendix B) start the engine and making sure that the speed control lever (2) is full counterclockwise against the setscrew (5), adjust the setscrew to obtain an Idle speed of 850-950 rpm. Lock the setscrew with the locknut (6).

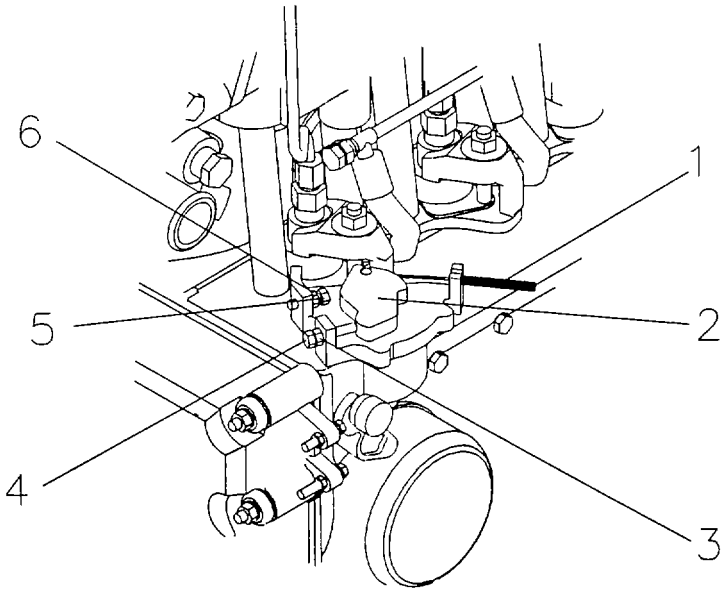


Figure 5-11. Engine Speed Setting.

b Setting the running speed

1) Increase the engine speed to 2650-2750 rpm and adjust the setscrew (4) to provide a positive stop at this speed. Lock the setscrew (4) with the locknut (3)

2) Adjust the throttle cable (1) so that the speed control lever (2) reaches the idle stop setscrew (5) when the panel mounted throttle handle (12, fig. 2-1) is fully pushed in

5.15 FUEL INJECTOR - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Inspection c. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.

General Safety Requirements:

WARNING

Fuels are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated DO NOT SMOKE.

Material/Parts Required
Grease (item 11, Appendix E).
Washer (item 4, Appendix I).
Seal, special, O-ring (item 5, Appendix I).

a. Removal. Refer to figure 5-12.

NOTE
Fuel injection components must be absolutely clean.

1) Disconnect and plug injector leak-off hose (13) from the injector body (3).

2) Remove the cylinder head cover nut (1) and rotate fuel tube clamp (5) out of way Discard seal, special (2)

3) Disconnect fuel tube nuts (8 and 14) and remove fuel tube (6)

4) Remove injector clamp bolt (10), clamp (9) and injector (3).

5) Remove and discard injector copper sealing washer (11) from the cylinder head taking care not to damage the sealing area and plug injector port.

b. Inspection Refer to figure 5-12.

1) Check nozzle body, needle and threads for deformation, obstructions and serviceability. If unserviceable replace injector

c. Installation, Refer to figure 5-12.

NOTE
Make sure that the sealing area in the cylinder head (12) is clean and smooth.

1) Apply a thin coat of grease (item 11, Appendix E) on one side of the new injector sealing washer (11) and install over the injector nozzle.

2) Install the injector (3).

3) Install the injector clamp (9), leaving the bolt (10) finger tight.

4) Install the fuel tube (6) and finger tighten the fuel tube nuts (8 and 14).

5) Fit new seal, special (2) into the recess on the cylinder cover (4).

6) Install the fuel tube clamp (5) Install cylinder head cover nut (1) and torque to 6.5 ft.lb./9.0 Nm.

7) Torque the injector clamp bolt (10) to 15.5 ft lb /21.0 Nm.

8) Tighten the fuel tube nuts (8 and 14.)

9) Install the injector leak-off hose (13).

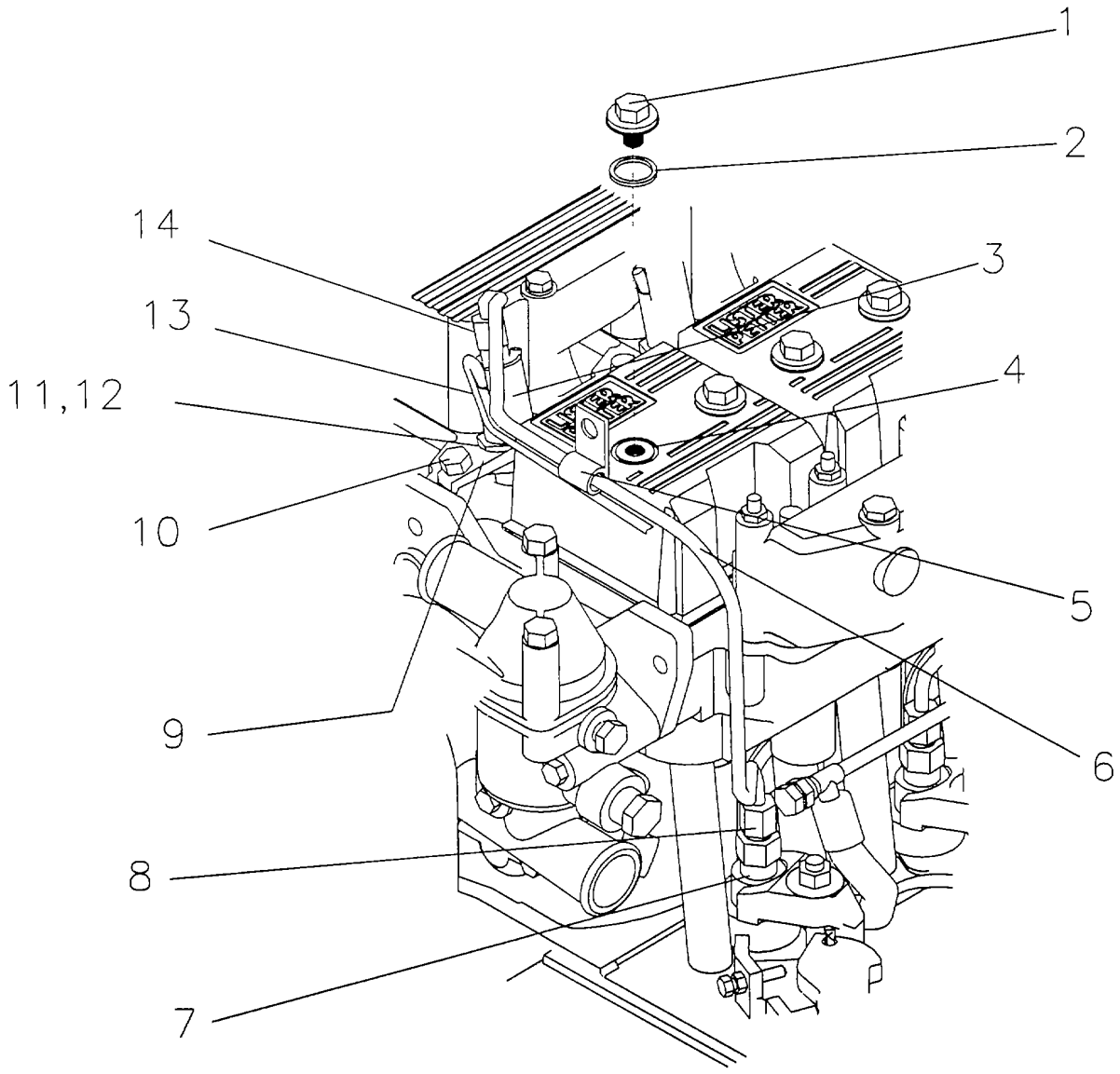


Figure 5-12. Fuel Injector.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Page

SECTION I GENERAL SUPPORT MAINTENANCE PROCEDURES 6-1

6.1 Introduction 6-1
6.2 Hydraulic Fluid Pump 6-1
6.3 Thermal Control Module 6-3
6.4 Engine Block Assembly 6-4
6.5 Governor Stop/Run Lever 6-7
6.6 Fuel Injector Pump 6-8

SECTION I. GENERAL SUPPORT MAINTENANCE PROCEDURES

6.1 INTRODUCTION This section details those major maintenance procedures which would be carried out at a general support level.

6.2 HYDRAULIC FLUID PUMP - REPLACE.

THIS TASK CONSISTS OF: a Removal b Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment Automotive Maintenance and Repair: Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Hydraulic fluid tank drained. Refer to paragraph 4.3
Cabinet top cover removed. Refer to paragraph 4.16.

General Safety Requirements:

WARNING
Hydraulic oils are toxic and flammable.
Do not use near heat or open flame
Area should be well ventilated. DO NOT SMOKE.

Material/Parts Required
Hydraulic fluid, item 7 or 8, Appendix E.

a. Removal. Refer to figure 6-1.

1) Remove the inlet hose (3) and adapter fitting (4) at pump (5). Remove the two discharge hoses at the hydraulic control manifold (7, fig. 5-5).

2) Remove screws (6), flatwashers (8) and lockwashers (7) holding pump (5) to engine.

3) Slide the pump (5) rearward.

4) Loosen screw (1) in the pump coupling (2) and remove coupling (2).

5) Remove the two discharge hoses (10) from the pump.

b. Installation. Refer to figure 6-1.

1) Install the coupling (2) on the pump (5) so the front face of the coupling is 1.8/2.0 inches (46/50 mm) from the front face of the pump Tighten setscrew (1) in the coupling (2).

2) Install the two discharge hoses (10) to the pump (5).

3) Install the pump (5) on the engine rotating it slightly to align the splines. Make sure the side of the pump with the single inlet port is on the same side as the inlet hose (3) and the double port side faces the discharge hoses (10). Install lockwashers (8), flatwashers (7), screws (6) and tighten.

4) Install the two discharge hoses at hydraulic control manifold (7, fig. .5-5).

5) Install the adapter fitting (4) and inlet hose (3) to pump

6) Fill the hydraulic fluid tank. Refer to paragraph 4 3

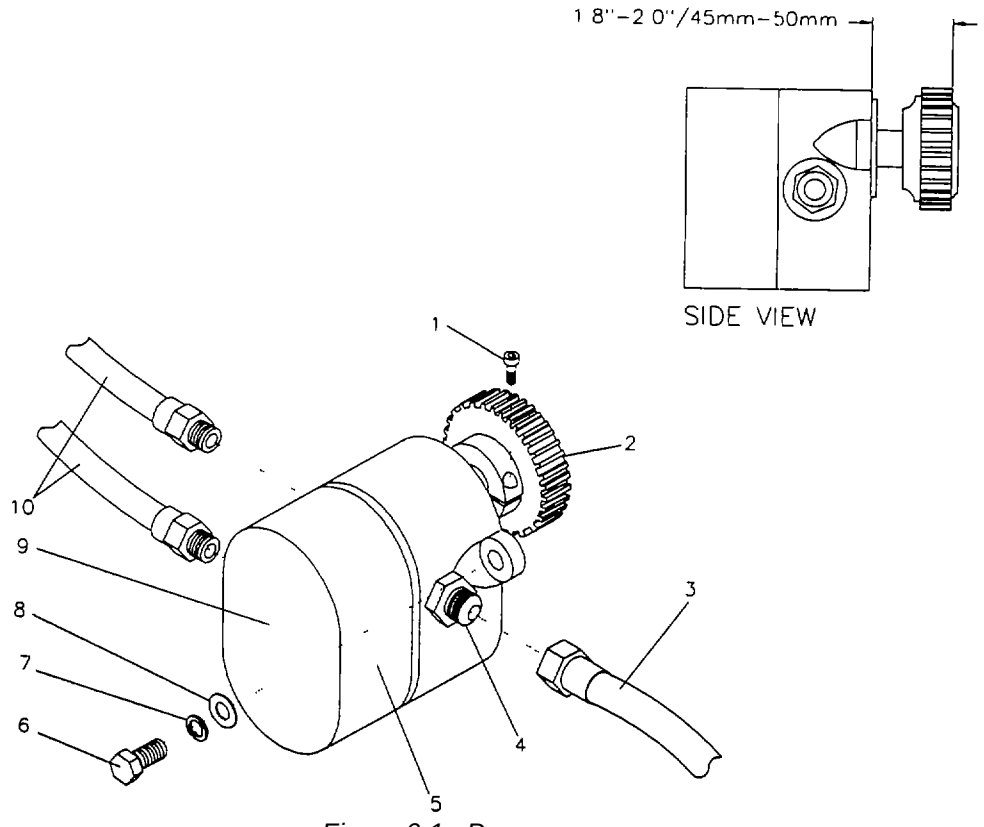


Figure 6-1. Pump.

6.3 THERMAL CONTROL MODULE - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B).

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected Refer to paragraph 4.19.
Hydraulic fluid tank drained. Refer to para. 4.3.

Material/Parts Required:
Silicone sealant, item 17, Appendix E.

a. Removal, Refer to figure 6-2.

1) Disconnect tube (1) from adapter (2)

2) Remove screws (8), lockwashers (7) and connection block (3) from the hydraulic control manifold (6)

3) Remove thermal control module (4)

b. Installation. Refer to figure 6-2.

NOTE

Silicone sealant is used to form a new gasket Ensure surfaces are free of contamination prior to application

1) Insert the thermal control module (4) in the cavity of the hydraulic control manifold (6).

2) Apply silicone sealant to surface of connection block (3)

3) Install the connection block (3) with screws (8) and lockwashers (7). Torque the bolts to 5 0 ft. lb./ 7 Nm.

4) Install tube (1) to adapter (2)

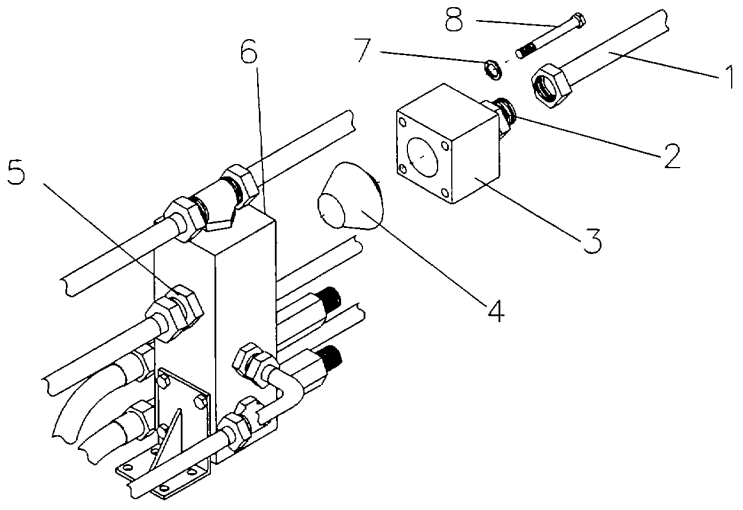


Figure 6-2. Thermal Control Module.

6.4 ENGINE BLOCK ASSEMBLY - REPLACE.

THIS TASK CONSISTS OF: a. Removal b. Installation

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section Ill, Appendix B)
Shop Equipment, Automotive Maintenance and Repair Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B).
Radiator fan removed Refer to paragraph 5.12.

General Safety Requirements:

WARNING

Hydraulic oils and fuels are toxic and flammable.
Do not use near heat or open flame.
Area should be well ventilated DO NOT SMOKE.

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Cabinet top cover removed. Referto paragraph 4.16.
Fuel tank drained. Refer to paragraph 4.17

Alternator removed. Refer to paragraph 4.25.
Starter removed Refer to paragraph 4.26

Material/Parts Required
Coolant/antifreeze, Item 1, Appendix E.
Fuel, item 5 or 6, Appendix E.

a. Removal Refer to figure 6-3.

NOTE
Tag all wires prior to removal.

1) Remove screw (15), lockwasher (14) and three battery ground cables (13) at the engine.

2) Loosen the clamp (11) on the air cleaner duct (12) and remove the air cleaner duct (12)

3) Remove wires (40, 43) from engine high temperature switch (42) Remove engine high temperature switch (42).

4) Remove nut (48) lockwasher (47), flatwasher (46) and wire (45) at engine temperature sending unit (44). Remove engine temperature sending unit (44) Discard lockwasher

5) Remove nut (31), lockwasher (32), wire (33) and oil pressure sending unit (34) Discard lockwasher.

6) Remove wires (39, 40), oil pressure switch (38), tee (37), nipple (36) and bushing (35). Plug cavity on engine.

7) Remove screws (28), lockwashers (29) and wires (30, 39) from fuel solenoid (27). Discard lockwashers.

8) Disconnect and plug fuel inlet hose (25) and fuel leakoff hose (26) at engine

9) Remove screws (21) lockwashers (22) and flatwashers (23) holding hydraulic fluid pump (20) to engine. Slide hydraulic fluid pump (20) back to clear engine, leaving hydraulic hoses (24) in place. Discard lockwashers.

10) Remove nuts (5), lockwashers (6) and wires (8) from glow plugs (3). Remove glow plugs. Discard lockwashers.

11) Loosen clamps (4) and remove upper (7) and lower (54) radiator hoses

12) Remove screws (50), lockwashers (51), screw (52), lockwasher (53) gasket (41) and muffler (49). Discard lockwashers.

13) Remove locknuts (19) special washers (17), steel straps (16), flatwashers (10), bolts (9) and shockmounts (18). Retain special washers (17) for future use Discard locknuts and shockmounts

14) Connect slinging hooks (1) to the two slinging points (2) on the engine and, using a hoist, lift the engine clear from the base. The engine in this condition will weigh approximately 400 lbs

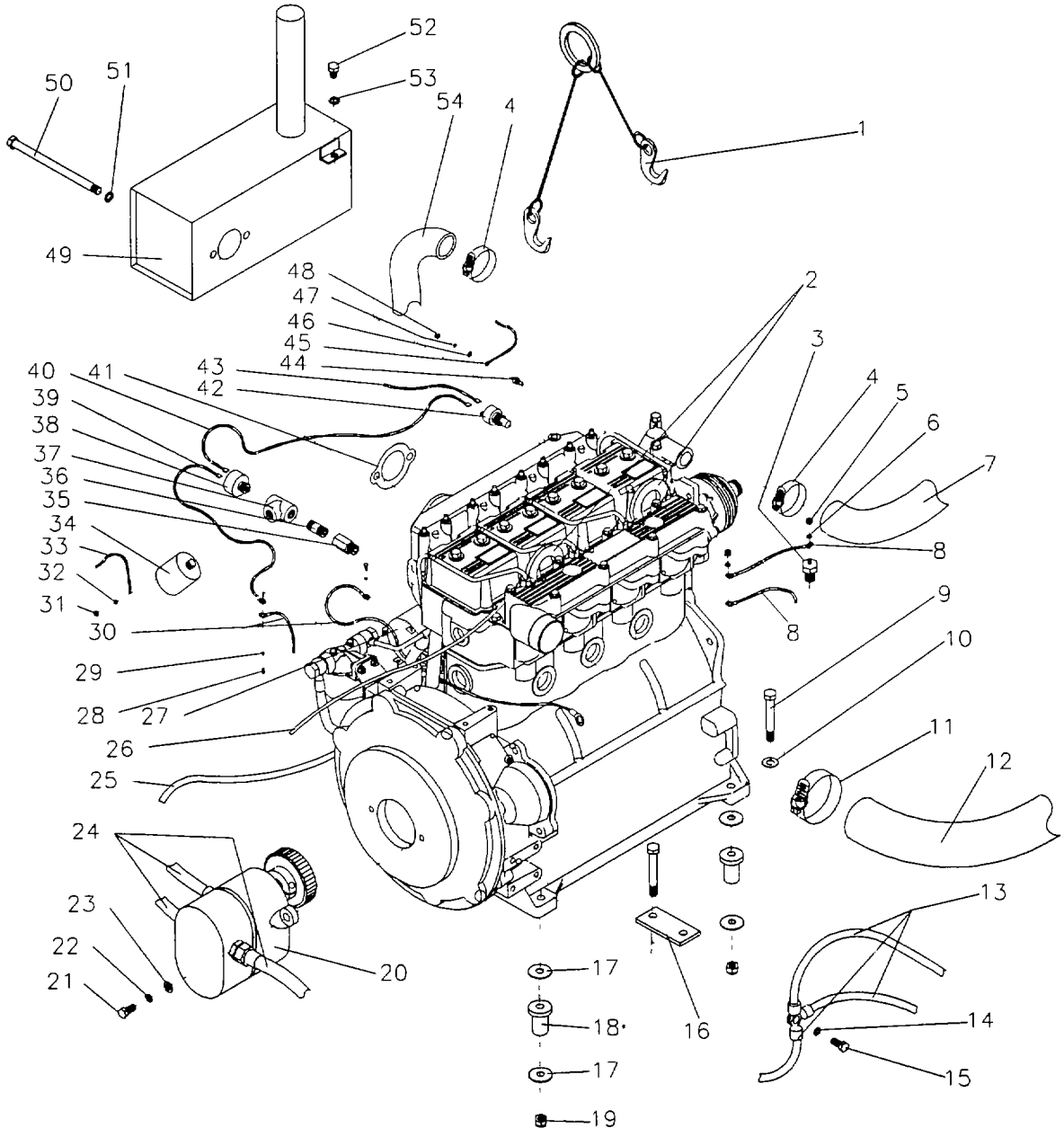


Figure 6-3. Engine Block Assembly.

b. Installation. Refer to figure 6-3.

1) Connect slinging hooks (1) to the two slinging points (2) on engine and using a hoist lift engine on to base.

2) Install the shockmounts (18), steel straps (16), special washers (17), washers (10), bolts (9) and nuts (19).

3) Install gasket (41), muffler (49), lockwashers (51), screws (50), lockwasher (53) and screw (52).

4) Install upper (7) and lower (54) radiator hoses Tighten clamps (4)

5) Install glow plugs (3) wires (8), lockwashers (6) and nuts (5).

6) Install pump (20) flatwashers (23), lockwashers (22) and screws (21).

7) Install fuel inlet (25) and fuel leakoff hoses (26)

8) Install wires (30, 39), lockwashers (29), and screws (28) to fuel solenoid (27).

9) Install bushing (35), nipple (36), tee (37), oil pressure switch (38) and wires (39, 40)

10) Install oil pressure sending unit (34), wire (33), lockwasher (32) and nut (31).

11) Install the engine temperature sending unit (44), wire (45), flatwasher (46), lockwasher (47) and nut (48).

12) Install engine high temperature switch (42) and wires (40,43)

13) Install air cleaner duct (12) and tighten clamp (11).

14) Install three battery ground cables (13), lockwasher (14) and screw (15)

6.5 GOVERNOR STOP/RUN LEVER - ADJUST.

THIS TASK CONSISTS OF: a. Adjustment

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section HII, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No 1, less power (item 6, Section III, Appendix B)
Governor setting gauge, item 2, Appendix B.

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.

a. Adjustment. Refer to figure 6-4.

NOTE

The governor must be correctly adjusted before the fuel pumps can be installed.

1) Turn the governor stop/run control lever (1) counterclockwise to the stop position

2) Adjust the screw (5) until It just touches the radiused part of the engine control lever (1) and lock in this position with the nut (4)

3) Insert governor setting gauge (6) between lever (1) and set screw (5) to obtain a dimension of 0.925 in/23 5 mm.

4) Adjust setscrew (2) to just touch the lever In this position

5) Tighten the setscrew locknut (3) and remove the governor setting gauge (6).

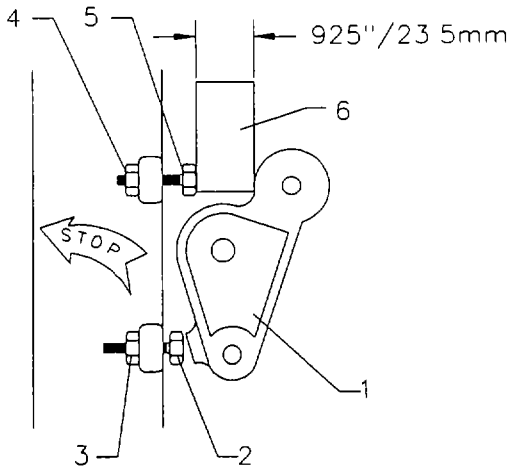


Figure 6-4. Governor Stop/Run Lever.

6.6 FUEL INJECTOR PUMP - REPLACE, ADJUST.

THIS TASK CONSISTS OF a. Removal b. Installation c. Timing

INITIAL SETUP

Tools:
Toolkit, General Mechanics (item 5, Section III, Appendix B).
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power (item 6, Section III, Appendix B).
Fuel pump rack setting gauge (Item 1, Appendix B).
Gear end oil seal tool (Item 3, Appendix B).
Flywheel locking tool (item 4, Appendix B).
Depth micrometer, 2" (item 7, Appendix B)

Equipment Condition:
Side panels (8, fig. 1-2) removed.
Battery disconnected. Refer to paragraph 4.19.
Radiator/Oil Cooler removed. Refer to para. 5.11.
Fan belt removed. Refer to paragraph 4.21.

General Safety Requirements:

WARNING
Fuels are toxic and flammable
Do not use near heat or open flame
Area should be well ventilated. DO NOT SMOKE.

Material/Parts Required
Shim Kits as required. Refer to TM 5-1730-245-24P.
Gasket, item 7, Appendix I.
Gasket, item 8, Appendix I.

a. Removal. Refer to figure 65.

NOTE

The four individual fuel injector pumps are located at the side of the engine between the push rods and are secured to the crankcase by a clamp (3) and nut (6). The fuel pump is not repairable. Each fuel pump is timed individually using the appropriate flywheel timing degree mark and when an existing or new fuel pump is installed it is only necessary to refit the existing shim pack or a new pack having the same thickness as the original. To retain the governor setting leave at least one fuel pump in position.

1) Disconnect and plug or cap off the fuel inlet line (25, fig 6-3) at the engine

2) Using a pair of pliers, squeeze and rotate fuel line clamp (2) at pump end. Remove the fuel line (1) from the fuel injector pump (5)

3) Turn the governor run/stop control lever (4) counter clockwise to the stop position.

4) Remove the fuel tube (6, fig 5-12).

CAUTION

If more than one fuel pump is being replaced take extreme care to ensure that each shim pack is kept with its relevant pump. Do not remove or add shims to this pack. Do not remove the tappet stud (1, fig. 6-6)) under any circumstances.

5) Remove the nut (6) and fuel pump clamp (3).

6) Lift out the fuel pump (5).

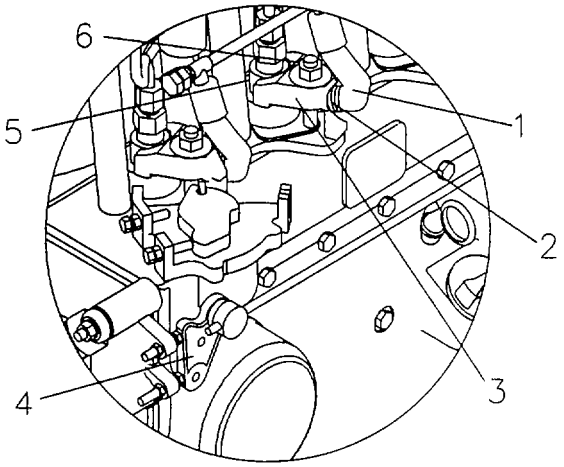


Figure 6-5. Fuel Injector Pump.

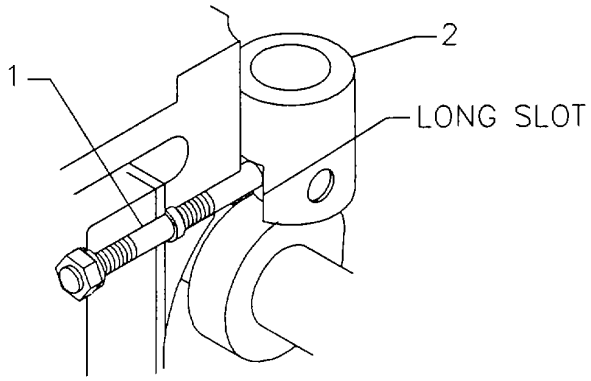


Figure 6-6. Fuel Pump Tappet.

CAUTION

Before installing fuel pump the governor stop/run lever must be correctly adjusted if the governor has been removed or is known to be out of adjustment. Refer to paragraph 6.5. If the fuel pump tappet (2, fig. 6-6) has been removed. It must be replaced with the longer slot facing outwards to ensure that it is correctly located over the end of the stud (1, fig 6-6).

b. Installation. Refer to figure 6-7.

NOTE

Use the flywheel locking tool to retain the flywheel while loosening the bolt.

1) Remove center bolt (4) which has a left hand thread and crankshaft pulley (5).

2) Remove the gear end cover (7), gear end oil seal (6) and gasket (8) to expose the governor mechanism.

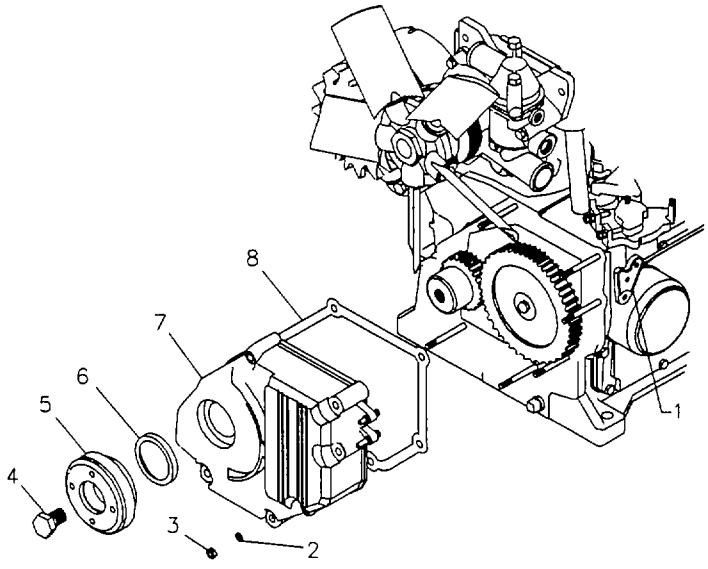


Figure 6-7. Gear End Cover

3) Make sure that the governor run/stop lever (4, fig. 6-5) is fully rotated counterclockwise to the stop position. Refer to paragraph 6.5.

4) Remove the flywheel locking tool and while pressing down on the top of the fuel pump tappet (2, fig.6-6) slowly rotate the crankshaft until the fuel pump tappet (2, fig. 6-6) is felt to be at its lowest position.

5) Secure fuel pump rack setting gauge (1, fig. 6-8) to the crankcase end face (3, fig. 6-8). Clamp the pump rack (2, fig. 6-8) with the end protruding 2.18 inches/55 5 mm from the crankcase end face (3, fig. 6-8).

6) Install the correct original shim pack on the fuel injector pump (5, fig 6-5).

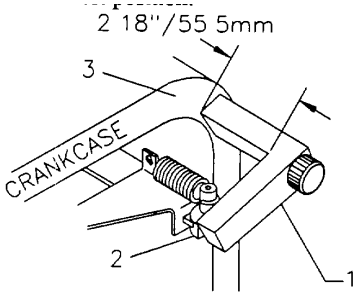


Figure 6-8.
Fuel Pump Rack Setting Gauge.

7) Insert the injector fuel pump (5, fig. 6-5) and shims gently into the crankcase making sure that the fuel injector pump pin engages In the slot In the fuel pump rack (2, fig. 6-8).

CAUTION

It is possible that the engine will not stop when required if the pump is not rotated counterclockwise or moves while being tightened

8) Carefully turn the injector fuel pump counterclockwise until the fuel pump rack (2,, fig 6-8) is felt against the stop (1, fig. 6-8) and, while holding it In this position, install the clamp and nut (3 and 6 fig. 6-5). The beveled face of the nut (6, fig. 6-5) faces down towards the clamp (3, fig 6-5). Take care to ensure the fuel injector pump (5, fig. 6-5) does not move.

9) Torque the nut (6, fig. 6-5) to 25.0 ft. lb.

10) Rotate fuel line clamp (2, fig. 6-5) and install fuel line (1, fig. 6-5).

11) Remove the rack setting gauge (1, fig 6-8) from the crankcase end face (3, fig. 6-8) and install the gear end cover (7, fig. 6-7), gear end oil seal (6, fig 6-7) and gasket (8, fig. 6-7) using the gear end oil seal tool to prevent damage to the oil seal.

12) Install the crankshaft pulley, (3, fig. 6-7) and secure with bolt (4, fig. 6-7) using the flywheel locking tool to hold the flywheel. Torque to 221 ft. lb. Remove flywheel locking tool.

c. Timing. Refer to figure 6-9.

NOTE

Fuel pump timing is only necessary if the original shims have been lost or mixed up with those of another pump. Each pump must be timed individually using the appropriate timing marks on the flywheel. The shims are color coded and are available in three sizes as follows,

Green	0.003 in./0.075 mm
Slate blue	0.005 in./0. 125 mm
Black	0.010 in./0.250 mm

1) Remove the nut (4), flatwasher (3) fuel lift pump (2) and gasket (5) to provide access to the flywheel timing window (1) in the crankcase.

2) The compression stroke can be determined by feeling the fuel pump tappet which will be rising to cause injection. Both valves will be closed. If the engine has been rotated past the 20 degree mark in the direction of rotation, turn it back past the mark and bring it up again in the direction of rotation in order to eliminate any gear backlash.

3) Set the related piston at 20 degrees before Top Dead Center (TDC) on the compression stroke by rotating crankshaft pulley (5, fig. 67) clockwise.

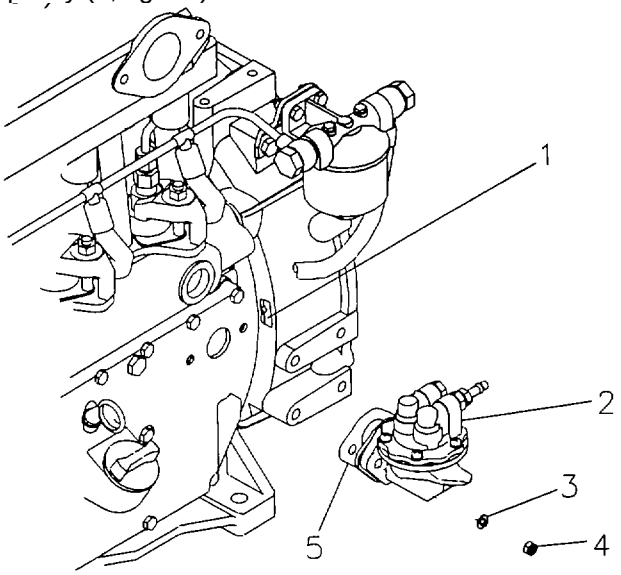


Figure 6-9. Flywheel Timing Window.

3) Using a depth micrometer, measure the distance between the top face of the crankcase to the top of the fuel pump tappet cap. This is shown as dimension "X" in figure 6-10 below.

4) Subtract this dimension from dimension "B" (2.012 in./51.2 mm). This gives the required thickness of shims to be inserted between the fuel pump plate (2) and the crankcase.

5) Install the fuel lift pump (2, fig 6-9) and new gasket (5, fig. 6-9).

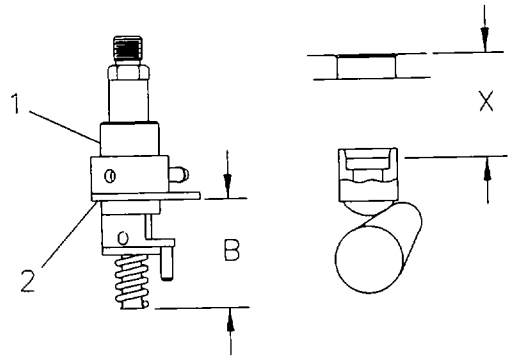


Figure 6-10. Fuel Pump.

APPENDIX A

REFERENCES

A-1. Scope.

This appendix lists all forms, manuals, technical manuals and other publications referenced in this manual.

Forms

Recommended Changes to Publications and Blank Forms ..... DA Form 2028
Recommended Changes to Equipment and Technical Manuals ..... DA Form 2028-2
Unsatisfactory Equipment Report ..... DA Form 468
Property Turn/in Tag (tag) ..... DA Form 1115
Report of Damaged or Improper Shipment (cut sheet) ..... DD Form 6
Product Quality Deficiency Report ..... SF 368
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404
Preventive Maintenance Schedule and Record ..... DD Form 314

Field Manuals

First Aid for Soldiers ..... FM 21-11
NBC Contamination Avoidance ..... FM 3-3
NBC Protection ..... FM 3-4
NBC Decontamination ..... FM 3-5

Technical Manuals

Operator's, Unit, Direct Support and General Support Maintenance Manual for Power Supply, Hydraulic, Model 9305 ..... TM5-1730-245-14
Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Power Supply, Hydraulic, Model 9305 ..... TM5-1730-245-14
Destruction of Army Material to Prevent Enemy Use ..... TM 750-224-3

Army Regulations

Issue of Supplies and Equipment.
Requisitioning, Receipt and Issue System ..... AR 725-50
Logistics (General). Report of Damaged or Improper Shipment ..... AR 700-58
Maintenance of Supplies and Equipment: Organizational, Policies and Responsibilities ..... AR 750-5
Safety, Accident Reporting and Records ..... AR 385-40

Miscellaneous

The Army Maintenance Management System ..... DA PAM 738-750
Marking for Shipment and Storage (Part 1 of 4) MIL-STD-129

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

SECTION I. INTRODUCTION

B-1. THE ARMY MAINTENANCE SYSTEM MAC .

a. This introduction (Section 1) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance system concept.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the

performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column 4 as:

Unit - includes two subcolumns, C (operator/crew) and 0 (unit) maintenance.
Direct Support - includes an F subcolumn.
General Support - includes an H subcolumn
Depot - includes a D subcolumn

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions are limited to and defined as follows

a. Inspect. To determine the serviceability of an Item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint or to replenish fuel, lubricants, chemical fluids or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring or diagnostic equipment's used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of die instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction or failure in a part, subassembly, module (component or assembly), end item or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify

maintenance significant components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the Item names of components, assemblies, subassemblies and modules for which maintenance is authorized

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2.

d. Column 4, Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in column 3, by indicating work time required (expressed as man hours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or Crew maintenance
O	Unit Maintenance
F	Direct Support Maintenance
L	Specialized Repair Activity (SRA)
H	General Support Maintenance
D	Depot Maintenance

e. Column 5, Tools and test equipment reference code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE and special tools, special TMDE and support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

f. Column 6, Remarks. When applicable this column contains a letter code, in alphabetic order, which is keyed to the remarks contained in section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS. SECTION III.

a. Column 1, Reference code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2, Maintenance level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment

e. Column 5, Tool Number. The manufacturers part number, model number or type number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Remarks Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated m the MAC, Section II.

SECTION II. MAINTENANCE ALLOCATION CHART
FOR
POWER SUPPLY, HYDRAULIC, MODEL 9305

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP. REF. CODE	(6) REMARKS CODE
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
00	Power Supply, Hydraulic								
01	Instruments and Controls	Inspect							
0101	Oil Pressure Override Switch	Inspect		.3				5	
		Replace		.3				5	
0102	Panel Mounted Instruments	Inspect	.2	.2					
		Replace			.5			6	
02	Cabinet Structure								
0201	Cabinet Top Cover	Inspect		.1					
		Replace		.5				5	
03	Hydraulic System	Inspect	.1						
0301	Hydraulic Fluid Tank	Inspect	.1	.1					
		Service		.5				5	
		Replace			1.2			6	
0302	Hydraulic Fluid Pump	Inspect	.1						
		Replace				1.3		6	
0303	Hydraulic Fluid and Filter	Inspect	2						
		Replace	.3					5	A
0304	Tubes and Fittings	Inspect	.3						
		Service	.5					5	
0305	Oil Cooler	Inspect		.2					
		Replace			1.5			6	
0306	Hydraulic Selector Valve Assembly	Inspect	.1						
		Replace			1.5			6	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP. REF. CODE	(6) REMARKS CODE
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
0307	Hydraulic Control Manifold	Inspect Replace			.2 1			6	
030701	Thermal Control Module	Inspect Replace				.2 .7		 6	
030702	Hydraulic Relief Valves	Inspect Replace			.5 .5	.5 .5		 6	 B
04	Drive System								
0401	Fuel Tank	Service Replace		.3	 1.2			5 6	
0402	Air Filter	Inspect Replace		.1 .2				 5	
0403	Engine Oil and Filter	Inspect Service Replace	.2	.2 .2 .7				 5	 E
0404	Battery	Service Replace		.2 .5				5 5	
0405	Engine Radiator	Inspect Replace		.2	 2			 6	
0406	Coolant/Antifreeze	Inspect Service Replace	.1	 .4 .7				 5 5	
0407	Radiator Fan	Inspect Replace			.2 1.2			 6	
0408	Fan Belt	Inspect Adjust Replace		.2 .5 .8				 6 6	
0409	Engine Assembly								
040901	Engine Block Assembly	Replace				16		6	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP. REF. CODE	(6) REMARKS CODE
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
04090101	Engine Cooling System								
0409010101	Water Pump	Inspect			.2				
		Replace			1.5			6	D
0409010102	Thermostat	Replace		1				5	C
04090102	Governor Lever System								
0409010201	Engine Speed Assembly	Adjust			1				
0409010202	Governor	Adjust				2.5		2,6	
04090103	Fuel System								
0409010301	Fuel Injector Pump	Inspect				1.5		6	
		Adjust				.5		1,3,4, 6,7	H
		Replace				2.5		6	
0409010302	Engine Fuel Filter	Inspect		.2					
		Replace		.7				5	F
0409010303	Fuel Control Solenoid	Inspect							
		Replace		.2				6	
1									
0409010304	Fuel Injector	Inspect			.2				
		Replace			1.5			6	G
040902	Alternator	Inspect		.2					
		Replace		.7				6	
040903	Starter	Inspect		.2					
		Replace		.7				6	
040904	Glow Plugs	Inspect		.2					
		Replace		.5				6	

SECTION III. TOOLS AND TEST EQUIPMENT FOR POWER SUPPLY, HYDRAULIC

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	H	Fuel Pump Rack Setting Gauge		9305-801
2	H	Governor Setting Gauge		9305-802
3	H	Gear End Oil Seal Tool		9305-803
4	H	Flywheel Locking Tool		9305-804
5	O	Tool Kit, General Mechanics	5180-00-177-7033	
6	F	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, less power	4910-00-754-0654	
7	H	Micrometer, Depth	5210-00-006-5950	

SECTION IV. REMARKS FOR POWER SUPPLY, HYDRAULIC

REMARKS CODE	REMARKS
A	Refer to Appendix I, Item 11.
B	Refer to Appendix I, items 2 and 3.
C	Refer to Appendix I, Item 1.
D	Refer to Appendix I, Items 6, 14 and 15.
E	Refer to Appendix I, item 12.
F	Refer to Appendix I, item 10.
G	Refer to Appendix I, items 4 and 5
H	Refer to Appendix I, items 7 and 8

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

SECTION I. INTRODUCTION

C-1. Scope.

This appendix lists components of the end item and basic issue items for the hydraulic power supply to help you inventory the items for safe and efficient operation of the equipment.

C-2. General.

The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections.

a. Section II, Components of End Item. This listing is for information purposes only and is not authority to requisition replacements. These items are not part of the hydraulic power supply. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

b. Section III, Basic Issue Items. These essential items are required to place the hydraulic power supply in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the hydraulic power supply during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items

C-3. EXPLANATION OF COLUMNS.

a. Column (1), Illus. Number, gives you the number of the item illustrated.

b. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

c. Column (3), Description and Usable on Code, identifies the Federal item name followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

d. Column (4), U/I (unit of issue), indicates how the item is issued for the National Stock Number shown on column 2.

e. Column (5), Qty Rqd, indicates the quantity required.

SECTION II. COMPONENTS OF END ITEM

C-4. There are no Components of End Item supplied with the hydraulic power supply.

SECTION III. BASIC ISSUE ITEMS

(1) ILLUS. NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	(4) U/I	(5) QTY RQR
1		Technical Manual, Operator's, Unit, Direct Support and General Support, TM 5-1730-245-14	1	1
2		Repair Parts and Special Tools List for Power Supply, Hydraulic, Model 9305, TM5-1730-245-24P	1	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

D-1. There are no additional items authorized for the hydraulic power supply.

APPENDIX E

EXPENDABLE AND DURABLE PARTS LIST

INTRODUCTION

E-1. SCOPE.

This appendix lists expendable and durable items that you will need to operate and maintain the hydraulic power supply. This listing is for information only and is not authority to you by CTA 50-790, Expendable/Durable Items.

E-2. EXPLANATION OF COLUMNS.

a. Column 1. Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g. "Use cleaning compound, item 5, Appendix D".).

b. Column 2. Level. This column identifies the lowest level of maintenance that requires the item.

c. Column 3. National stock number. This is the national stock number assigned to the item which you can use to requisition it.

d. Column 4. Item name, description, Commercial and Government Entity Code (CAGEC), and part number. This provides the other information you need to identify the item.

e. Column 5. Unit of measure This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

SECTION II.
EXPENDABLE / DURABLE SUPPLIES AND MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
1.	O	6850-00-181-7929	Antifreeze, Ethylene glycol, 1 gallon can (81349), PIN M46153B, MIL-A-46153	gl
2.	O	9150-00-189-6727	Lubricating oil, 1 quart (81349), MIL-L-2104 10W	qt
3.	O	9150-01-178-4725	Lubricating oil, 1 quart (81349), MIL-L-2104 15W/40	qt
4.	O	9150-01-178-4726	Lubricating oil, 1 quart (81349), MIL-L-2104 30W	qt
5.	O	9140-00-286-5286	Diesel fuel, 55 gallon drum, ASTM D-975-77, Grade No 1-D	gl
		9140-00-286-5294	Diesel fuel, 55 gallon drum, ASTM D-975-77, Grade No 2-D	gl
6.	O	9130-01-305-5597	Turbine Fuel, Aviation, 55 gallon drum (81349), MIL-T-83133/NATO F-34 (JP-8)	gl
7.	O	9150-00-191-2772	Lubricating oil, 55 gallon drum (81349), MIL-L-2104, grade 10W	gl
8.	O	9150-00-111-6255	Hydraulic oil, 55 gallon drum (81349), MIL-H-46170, Type 1/NATO H-544	gl
9.	0	9150-01-278-1356	Lubricating 011, 1 Quart (81349) MIL-L-46152A/B Grade 5W/30	qt
10.	0	6810-00-249-9354	Sulfuric Acid, Electrolyte; for storage batteries, Class 3 (81348) O-S-801	gl
11.	F	9150-00-235-5555	Grease (81349), MIL-G-23549	oz
12.	H	8030-01-309-9833	Caulking Compound (58536), A-A-272	oz
13.	O		Air Filter (29516), 9305-218	ea

EXPENDABLE / DURABLE SUPPLIES AND MATERIAL LIST (cont'd)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
14.	O		Fuel Filter (29516), 9305-216	ea
15.	O		Hydraulic Oil Filter (29516), 9305-217	ea
16	O		Engine Oil Filter (29516), 9305-215	ea
17	H	8040-00-145-0075	Sealant, Silicone (81349) MIL-A-46106A, Group I; Type II; Color, Clear	oz
18.	F	8010-00-597-5251	Mineral Spirits ASTM-D235-83	gl
19.	O	6810-01-389-9588	Distilled Water	gl

APPENDIX F

OPERATOR LUBRICATION INSTRUCTIONS

F-1. There are no lubrication instructions specific to operator maintenance.

APPENDIX G

ILLUSTRATED LIST OF MANUFACTURED ITEMS

G-1. There are no authorized manufactured items for the hydraulic power supply.

APPENDIX H

TORQUE LIMITS

Torque limits are called out for each application throughout this manual. The following table is a summation of all the torque values applicable to the hydraulic power unit.

DESCRITON	Nm	ft. lb.
Stop/run control assembly screw.	7.0	5.0
Crankcase door bolt.	9.0	6.5
End cover nuts or bolts.	9 0	6.5
Fuel filter bracket screw.	9.0	6 5
Manifold bolts.	9.0	6.5
Oil pump setscrew.	9.0	6.5
Camshaft thrust plate screws	9 0	6.5
Governor weight plate screws.	9 0	6.5
Rocker cover nut.	9.0	6.5
Alternator adjusting link	16.0	12.0
Attaching bolt to back plate.	16.0	12 0
Water pump studs (not bolts)	16.0	12.0
Fuel filter union plug	20 0	15 0
Fuel lift pump.	21.0	15.5
Injector clamp nut	21 0	15 5
Alternator bolt	21 0	15 5
Water pump bolts and nuts	21 0	15 5
Center bearing housing bolts.	21 0	15.5
Injector pipe nuts.	22.0	16 0
Connecting rod bolt	24 0	18 0
011 strainer tube nut.	27.0	20 0
Radiator fan nut.	30 0	22.0
Fuel pump clamp.	34 0	25.0
Valve rocker nut.	34 0	25.0
Starter motor bolt.	41 0	30.0
Oil pump relief valve.	41 0	30.0
Injector nozzle nut.	46.0	34.0
Fuel pump delivery valve holder.	47.0	35 0
Flywheel bolt.	68.0	50.0
Flywheel housing screw.	79.0	58.0
Cylinder head nut. Stage one.	8.0	6.0
Stage two.	48.0	35.0
Stage three.	88.0	65.0
Crankshaft pulley bolt.	300 0	221.0
Starter motor terminals	8.8	6.5

APPENDIX I

MANDATORY REPLACEMENT PARTS

I-1. GENERAL. The following table lists mandatory replacement parts for the hydraulic power supply.

Table I-1. Mandatory Replacement Parts.

ITEM	CAGE CODE	PART NUMBER	DESCRIPTION
1.	97947	751-40280	Gasket, thermostat housing
2	96906	MS28778-08	Packing, preformed (O-ring)
3.	96906	MS28775-012	Packing, preformed (O-ring)
4	97947	201-45070	Washer, Injector sealing
5.	97947	201-81200	Seal, special, O-ring
6.	97947	751-40211	Gasket, water pump
7.	97947	751-1 2842	Gasket, fuel lift pump
8.	97947	751-1 2800	Gasket, crankcase gear end cover
9	29516	9305-218	Air Filter
10.	29516	9305-216	Fuel Filter
11.	29516	9305-217	Hydraulic Fluid Filter
12.	29516	9305-215	Engine Oil Filter
13.	29516	9305-212	Shockmounts
14.	97947	601-20691	Packing, preformed (O-ring)
15	97947	751-40450	Gasket, water pump mounting plate

INDEX

Subject — Paragraph, Fig., Table No.

A

Abbreviations 1.8
Additional Authorization List D-1
Administrative Storage, Special Instructions for 4.29
Air Filter 4.18
Alternator 4.25

B

Basic Issue Items C-1
Battery 4.19

C

Cabinet Top Cover 4.16
Changing the Oil Filter 4.2
Circuit Description 1.14
Common Tools and Equipment 4.4
Component of End Item and Basic Issue List C-1
Control Panel ..... F 2-1, 2.1.1
Control Panel Decals ..... F 2-4
Corrosion Prevention and Control 1.7

D

Decals and Instruction Plates 2.11
Destruction of Army Materiel to Prevent Enemy Use 1.3
Direct Support Maintenance Procedures 5.3
Direct Support Malfunction Index ..... 5.2, T 5-1
Direct Support Troubleshooting ..... 5.1, T 5-2

E

Engine Coolant 4.20
Engine Oil Change 4.2
Engine Oil and Filter 4.2
Engine Radiator, Removal and Installation 5.11
Engine Radiator, Service 4.20
Engine Block Assembly 6.4
Engine Speed Setting 5.14
Equipment Characteristics, Capabilities and Features 1.10
Equipment Data 1.12
Expendable and Durable Parts List E-1

INDEX

Subject — Paragraph, Fig., Table No.

F

Fan Belt 4.21
Fuel Control Solenoid 4.24
Fuel Filter, Removal and Installation 4.23
Fuel Injector 5.15
Fuel Injector Pump 6.6
Fuel Tank, Draining and Refilling 4.17
Fuel Tank, Removal and Installation 5.10
Functional Groups 1.13

G

General Support Maintenance Procedures 6.1
Glow Plugs 4.27
Governor Stop/Run Lever 6.5

H

High Temperature Operation 2.13
Hydraulic Control Manifold 5.8
Hydraulic Filter Change 4.3
Hydraulic Fluid Change 4.3
Hydraulic Fluid and Filter 4.3
Hydraulic Fluid Pump 6.2
Hydraulic Fluid Tank 5.5
Hydraulic Power Supply ..... F 1-1
Hydraulic Power Supply, Front Connections ..... F 2-2, 2.12
Hydraulic Relief Valves 5.9
Hydraulic Schematic ..... F 1-4
Hydraulic Valve Assembly 5.7

I

Illustrated List of Manufactured Items G-1
Introduction to PMCS Table 2.2, 4.10

L

Leakage Definitions for Operator PMCS 2.4
List of Abbreviations 1.8
Location and Description of Major Components 1.11
Low Temperature Operation 2.12
Lubrication Instructions 4.1

INDEX

Subject — Paragraph, Fig., Table No.

M

Maintenance Allocation Chart B-1
Maintenance Forms, Records and Reports 1.2
Mandatory Replacement Parts I-1
Major Components ..... F 1-2, F 1-3

N

Nuclear, Biological and Chemical (NBC) Decontamination Procedures 2.14

O

Oil Cooler 5.6
Oil Pressure Override Switch 4.15
Operating Controls and Indicators 2.1
Operation min Combined Mode 2.9
Operation in Dual Mode 2.8
Operator Lubrication Instructions F-1
Operator's Preventive Maintenance Checks and Services ..... T 2-1
Operator PMCS Procedures 2.3
Operator Troubleshooting 3.2
Operator Troubleshooting Chart 3.3
Operator's Maintenance Procedures 3.4

P

Panel Mounted Instruments 5.4
PMCS Procedures 2.3, 4.11
PMCS Table 4.12
Preparation for Storage and Shipment 1.4, 2.5, 4.28
Preparation for Use 2.5, 4.8
Pressure System 1.14.1

Q

R

Radiator Fan 5.12
Radiator, Removal and Installation 4.20
Rear Access Decals ..... F 2-5
References A-1
Repair Parts 4.6
Reporting Equipment Improvement Recommendations 1.5

INDEX

Subject	Paragraph, Fig., Table No.
S	
Sampling Valve Decal	F 2-6
Scope	1.1
Service Upon Receipt	4.7
Slave Receptacle	2.7
Special Tools, TMDE and Support Equipment	4.5
Speed Setting	5.14
Starter	4.26
Starting the Hydraulic Power Supply	2.6
Stopping the Hydraulic Power Supply	2.10
T	
Thermal Control Module	6.3
Thermostat	4.22
Torque Limits	H-1
U	
Unit Lubrication Instructions	4.1
Unit Maintenance Procedures	4.15
Unit Malfunction Index	T 4-3
Unit PMCS Procedures	4.11
Unit PMCS Table	412, T 4-2
Unit Troubleshooting	413, T 4-4
V	
W	
Warranty Information	1.6
Water Pump	5.13
X	
Y	
Z	

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THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3.2808.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu in.
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Square measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. in.
1 sq. decimeter = 100 sq. centimeters = 15.5 inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 feet
1 sq. dekameter (are) = 100 sq. meters = 1.076.4 sq. ft.
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 hectometers = .386 sq. miles

Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons
1 liter = 10 deciliters = 33.81 fl. ounces
1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3 38 fl. ounces
1 metric ton = 10 quintals = 1.1 short tons

Approximate Conversion Factors

To change	To	Multiply by
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
miles	kilometers	1.609
sq. inches	sq. centimeters	6.451
sq. feet	sq. meters	.093
sq. yards	sq. meters	.836
sq. miles	sq. kilometers	2.590
acres	sq. hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29.573
pints	liters	.472
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound inches	newton-meters	.11296

To change	To	Multiply by
ounce inches	newton-meters	.0070062
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
sq. centimeters	sq. inches	.155
sq. meters	sq. yards	10.764
sq. kilometers	sq. miles	1.196
sq. hectometers	acres	2.471
cubic meters	cubic feet	35.315
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102
pound-feet	newton-meters	1.356

Temperature (Exact)

°F Fahrenheit temperature — 5/9 (after subtracting 32) — Celsius Temperature °C

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